How Much Can You Save With a Small Car? PAGE 78 AUGUST - 35c Monthly First Really Portable TV How It Works How Good Is It? PAGE 64 AFCHANICS --- HANDICDAFT SECTION ----

## PROGRAM

## Short-Cuts ve Skills

Get Ahead Faster



NOW-in your own home-you can master the fundamentals of success-pave the way to a richer life for yourself and your family. You can benefit from the most practical, scientific plan ever devised to belp men increase their earning power. Others have paid hundreds of dollars to learn the tested and proven success secrets now available to you in this remarkable new Program at the low cost of only a few pennies a day.

The New Nelson Doubleday

## PERSONAL SUCCESS PROGRAM

Month by month, the Nelson Doubleday Personal Success Program will show you how to develop the basic executive abilities that pay such handsome dividends today. One by one you'll acquire the important skills that mark "the man on the way up" — skills in getting along with people — creating ideas — understanding business figures — winning friends wherever you go — speaking in public — remembering names and faces — writing business letters, reports and memos.

You start with a remarkable memory trainer. Then every 30 days you will receive a new self-training Progress Kit on an important phase of the Program—another shortcut to mastery of an essential success subject.

There has never been anything like these "Progress Kits" available — for completeness, authority and detailed step-by-step guidance. Nothing has been left out. The expert business leaders, psychologists and educators who planned the Program have included all the know-how and actual practice you need. Their simplified new self-instruction method enables you to gain "practical experience" in the odd moments that now go to waste every day.

### Sample "Time-Organizer" Kit only 10¢

A REMARKABLE

NEW WAY TO

To introduce you to this new kind of personal achievement plan. Nelson Doubleday offers you a valuable "sample kit" almost as a gift. You'll receive a remarkable 10,000 word handbook — How To Organize Your Time — that helps you master the simple techniques used by successful executives to get more done in a business day with much less effort. With these valuable tips for outwitting the clock, you can move ahead faster on the job—and have more time for your family, favorite hobbies, new friends, community activities.

As with each Progress Kit in the Program, a set of handy practice and application cards accompanies the handbook to help you "learn by doing." Slip them into the pocket holder provided — for use in your spare moments. They help you apply tested efficiency short-cuts to your own job immediately.

Along with the material in your "Time-Organizer" Kit—as an extra bonus to launch your own Personal Success Program—you will receive a complete selfevaluation aptitude test.

### Will you invest 10¢ in your future?

There's plenty of room for you "at the top." Leaders are sought and welcomed more than ever in the business world today. To begin qualifying for the opportunities ahead, accept the valuable introductory package offered by the Personal Success Program for only 10c. There is no obligation whatever—and no salesman will call. This is a "demonstration offer."

If you are delighted with your first kit and wish to continue with the Program, you will receive a new Progress Kit each month, for which you will pay - not the many dollars charged by most "schools" - but only \$1 plus small shipping cost. You stop whenever you like. Mail the card today - send 10¢ later. Nelson Doubleday Personal Success Program, Garden City, N. Y.

## Here's What You Get for only

1. "HOW TO ORGANIZE
YOUR TIME" — the self-instruction handbook that shows
you haw to "find" 500 extra
haurs a year — how to become
the man who gets things done
with executive efficiency.

2. "TIME-ORGANIZER"
POCKET CARDS—on exclusive
feature of the Personal Success
Program that provides real-life
practice and enables you to
apply dozens of simple timesaving techniques directly to

your job. Handy pocket holder included with these cards.

 HANDSOME DESK FILE pictured at right, for convenient storing of your Progress Kits.

4. FREE BONUS GIFT:

Self-Scoring

### APTITUDE TEST

Complete 32-page self-evaluator that scientifically reveals to you — and you alone—your present aptitudes, vocational interests, and "hidden potential."



## INDIAN TERRITORY



AND WE MEAN CIGAR STORE INDIAN TERRITORY THAT'S BEEN INVADED BY A WON

## PHILLIES CHEROOTS



The smoke signal you get from Gheroots is

## MIRACLE MI

Whoop it up with a cigar that's new in size and shape





Good Driving: Do you know the safest way to pass? P. 51



Fence Fights: Be sure the law is on your side. P. 142



Lightning: Why nature stages her big show. P. 58

Founded in 1873 Vol. 175 No. 2

Mechanics and Handicraft MSO. U. S. PAY. UFF.

## Popular Science

August, 1959	SPECIAL FEATURES
Cover photo by W. W. Morris	The Awesome Miracle of Lightning 58
and Robert D. Borst	They Drink "Undrinkable" Water 69
CARS AND DRIVING	TV Crosses the Atlantic 72
Detroit Report 48	The Great American Oil Rush 83
How to Drive and Stay Alive 51	I Lied to a Lie Detector 91
What You Save with a Small Car 78	Line Fences and the Law142
How a Speedometer Works100	Shooting Motorcycle Races148
Drivers Make Own Green Lights112	How to Have Ants in the House152
	Traffic Tests for "Sea Drivers"168
SCIENCE AND INDUSTRY	
How Safe Is Our A-Ship?108	DISCOVERIES AND INVENTIONS
Crashed Airliners Fly Again115	Now Missiles May Ride the Rails 74
Gremlins in Printed-Circuit TV164	Pipe-Layer Walks on Own Legs 95
CONSUMER NEWS	The Tent That Rides on a Boat138
First Really Portable TV 64	AUTO UPKEEP
New for Car, Shop and Home 104	Hints from the Model Garage171
Pushbutton Garage Doors156	Gus Salvages a Vacation174

### Editor: HOWARD ALLAWAY

Andstant Managing Editors Kandall W. Goodwyn Robert P. Stevenson Senior Editors Devon Francis, Martin Mann Everett H. Ortner Technical Editor Hubert Luckett Detroit Editor Ken Fermoyle West Coast Editor Wesley S. Griswold

7 POPULAR SCIENCE AUGUST 1959

Managing Editor FRANK ROWSOME JR.

Associate Editors Erik H. Arctander, Alden P. Armagnac Henry B. Comstock, Frank Dorr Sheldon M. Gallager, James T. Howard Herbert O. Johansen, Herbert ft. Pfiater

Editorial Assistants Ross Lee Boeland (Chief)

Joan Steen, Ruth Westphal

Marie A. Brew, Anna Dallas Bebe Lipson, Roberta Marks Georgette Sparks

Art Director HOWARD C. JENSEN

Art Editors

Herbert Anthony, Reginald A. Hawley Harry Samuele

Art Associates

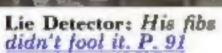
Bertrum Green, Erle A. Katzninski Jr. Henry W. Karmirowski, Richard J. Moyer Dana B. Rasmussen

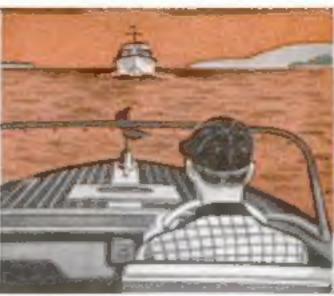
Photography

W. W. Morris (Chief) Robert D. Bottl, Orlando Guerra

EDITORIAL OFFICES: 355 Lexington Ava., New York 17, N. Y.







Traffic Code: At sea, who's got the right of way? P. 168



Cement Mixer: What would I do without it! P. 121

## Monthly

America's Leading New-Idea Magazine for 87 Years

PICTURE NEWS	
Russians Twist PS News Item	56
Recovering a Space Capsule	. 88
What Earthripper Can Do	. 93
Trailer Swallows Its Load	. 99
"Air Raid" on a Forest Fire	.102
Platform in the Sky	.111
Tree Uprooter Clears Acres	.119

The DEW Line Grows

FOR HOME AND SHOP	
My Wonderful Cement Mixer	121
Repairing Room Air Conditioners	129
Fix-It File:	
Reglazing Metal Sash	135
7 Extra Uses for Adhesive Tape	146
For the Handyman, Outdoors	154
A Garden-Tractor Dump Barrow	163
Weldless Weather Vane	179

THE PROPERTY.	ARCHITECTURE	A 4125	THE PARTY NAMED IN
APRESING I	CUTS	O PHILI	1 1 2 7 7 7

How to Improvise an S Hook	.125
Removing Radio and TV Tubes	.128
Finding the Center of a Hole	.137
Storing Hacksaw Blades	.141
Packing Special China Pieces	.147
Door-Top "Safe" for Jewelry	155
Drill-Press Pipe Jig	161
Sturdy Knockabout Stool	162
Replacing a Floor Board	.167
House Marker, Florida Style	.182

EVERY MONTH	
PS Readers Talk Back	4
Have You Heard?	14
The Month in Science	
New Ideas from the Inventors	
I'd Like to See Them Make	77
Wordless Workshop	126

Publisher EUGENE S. DUFFIELD

Advertising Manager LEE P. ADAMS

Circulation Director EUGENE WATSON

### ADVERTISING OFFICES:

MEW YORK-355 Lexington Ave. CHICAGO-360 North Michigan Ave. perport -2810 Hook Bidg-BAN FRANCISCO-114 Sansome St. CLEVELAND-636 R. F. Keith Bldg. 104 ANGELES-711 South Vermont. PORTLAND, DRE.-520 S.W. Sixth Ave.

### SUBSCRIPTION SERVICE:

Address all subscriptions and correspondence concerning them to: Popular Science Subscription Department, 355 Lexington Ave., New York 17, N. Y. Allow four

weeks' notice for change of address. Please give both old and new addresses, including zone numbers. Published monthly at 353 Lexington Are., New York 17, N. Y., by Popular Science Publishing Co., Inc., Godfrey Hammond, Chairman of the Board; Eugene S. Duffield, President; Franklin E. Parker Jr., Secretary; Eugene Watson, Vice-President; Robert D. Beals, Treasurer and Business Manager, Secondclass postage paid at New York, N. Y., and at additional making offices. Entered as second class matter at the Post Othce Department, Canada. Printed in U.S.A.

Copyright, 1959, by Popular Science Publishing Co., Inc. All rights reserved in the United States, Great Britain, and in all the countries participating in the International Copyright Convention and Pan-American Copyright Convention. Single copy 35¢, Subscriptions to United States, its possessions, and Canada, I year \$3.40 (2 years \$6.00, 3 years \$8.00). Elsewhere, I year \$6.00 (2 years \$11.00, 3 years \$16,00), Send notice of undelivered copies on Form 3579 to Popular Science Monthly, 355 Lex-Ington Avenue, New York 17, N. Y.

## PS Readers

### TALK BACK



### Lo, the Poor Pedestrian

Let's have more articles like "Stupid Traffic Rules" [April]. Maybe you could tell the pedestrian's sad story, too. In Philadelphia at 15th and Market, it takes 17 steps to cross the street—but the light changes as you take your fourth step.

P. D. JONES JR., State College, Pa.

### **Car News Suits Them**

As an automotive engineer, I'd like to thank you for your fine articles on automobiles. I think "Your Next Car's Electric System" [May] and the piece on transaxles some time last year [July '58] deserve special applause.

ROBERT L. WHITE, Saginaw, Mich.

... The study of automobile ignition systems back in my schooldays, when many cars were started with a hand crank, left me with a strong impression that there must be a better way to do it.

Your description and illustrations of the newest ideas indicate giant strides in that direction. Your diagrams made the ideas quite clear, even to an amateur, and I enjoyed the article thoroughly.

W. E. ADAMSON, Rochester, N. Y.

### Fan Discusses Tape

I have had a tape recorder for six years, so "What's Coming in Stereo Tape" [June] was interesting to me. My tape library exceeds half a hundred volumes, and I certainly agree that tape has many advantages over the disc.

You say "tape doesn't get noisy with use" and "never wears out." This is true with the more expensive brands. One of the cheaper brands I've tried develops an irritating screech after replay a number of times. This doesn't disappear with erasing and rerecording.

Another that costs a bit more has a tendency to lose oxide from portions of the tape, thus permitting several inches to slip by the playing heads at a faster speed than the rest. The 1,800- and 2,400-foot reels tend to stretch readily, lowering tone. But my favorite brand (an 1,800-foot reel) will break before it will stretch enough to harm the recording.

JAMES SYKES, Colorado Springs, Col.

### Old Mechanic Talks Back

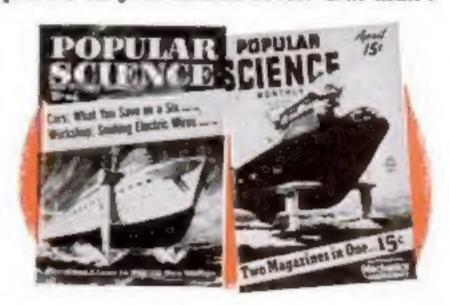
As an old retired auto mechanic, I agree with Mr. Bezek ["PS Readers Talk Back," June] that there's a lot to be said for timing with ping.

I can well recall setting the spark ahead on old Model Ts by bending the spark advance lever—there was no other way to mechanically change the setting. Thus we could tune up an old car with just the hint of a ping. And would that old T shag the gravel from under her rear wheels! You had to be careful: If you set the spark too far in advance, you might end up with a damaged arm from kickback when cranking the motor by hand.

H. O. WHITE, Amberg, Wis.

### **Just Progress**

THAT was certainly a very interesting picture on your March cover. But didn't



I see the same thing 20 years ago on your April, 1939, cover?

B. LINDENBAUM, Dayton.

### Words Fail Us

THIRTY years' experience as a do-ityourself woodworker made "Carpenter's

A POPULAR SCIENCE AUGUST 1959

CONTINUED

### "Your name is on the list"



Doug Mott was not surprised. The recession was on and the assembly line where he worked was almost at a standstill.

And then, strangely, the boss began to smile. "You know how the Engineering Department sends us blueprints and then we have to send them back for revision because they just aren't practical to produce?" Doug nodded . . . wondering. "That's waste . . . and we can't allow it to continue. That's why we thought that if we had a man who knew assembly and production - and drafting, too - he could act as liaison man between engineering and production. You know production, Doug . . . and you're studying drafting with I.C.S. You've got a new job. Congratulations!"

Doug Mott now heads a drafting room. But he will never forget the day his name was on the list to be laid off.

Good times or bad, I.C.S. training sets a man off from his fellows, puts him on the road to promotion. You can start on that road by filling out the coupon now!

For Real Job Security-Get an I. C. S. Diploma!

I. C. S., Scranton 15, Penna.

Accredited Member, **National Home Study Council** 



AUTOMOTIVE    Elements of flucture Energy   Practical Electrician   Refrigoration and   Tractic Designing   Tractic Designing   Tractic Designing   Tractic Designing   Tractic Designing   Tractic Designing   Tractic Design   Tr		ANTON 15, PENNA.  In the "How to SUCCEED" and the AVIATION  Arca-Engineering Technology  Aircroft & Engine Mechanic  BUSINES  Accounting  Advertising  Business Administration  Business Management  Cest Accounting  Creative Salesmanship  Managing a Small Business  Professional Secretary  Public Accounting  Public Accounting  Public Accounting  Professional Secretary  Public Accounting  Professional Secretary  Public Accounting  Professional Secretary  Public Accounting  Changement  Traffic Management  CHEMICAL  Analytical Chemistry  Chemical Engineering  Chem. Leb. Technician	CIVIL ENGINEERING Civil Engineering Construction Engineering Highway Engineering Professional Engineer (Civil) Reading Struct Bluegrints Sanitary Engineer Structural Engineering Surveying and Mapping DAAFTING Aircreft Drafting Architectural Drafting Construction & Machine Design Electrical Drafting Mechanical Drafting Mechanical Drafting Sheet Metal Drafting Electrical Engineering Electrical Engineering Electrical Engineering Electrical Engineering Electrical Engineering	Geod Enginh High School Mathematics High School Science Short Story Writing LEADERSHIP Industrial Foremenship Industrial Seperation Personnel-Labor Relations Supervision An ECHANICAL and SHOP Disease Engines Gas-Elec. Welding Industrial Engineering Industrial Engineering Industrial Safety Machine Shop Practice Mechanical Engineer (Mech) Professional Engineer (Mech) Desiry Control	
Name Address	AUTOMOTIVE  Automobile  Auto Body Rebuilding and Rafinishing  Auto Engine Tunner	Elements of Nuclear Energy     General Chemistry     Hatural Gas Prod. and Trans.     Petroleum Prod. and Engr.     Prolessional Engineer (Chem)	Practical Electrician Practical Lineman Professional Engineer (Elec)	Refrigeration and Air Conditioning Teel Design   Tool Making RADIO, TELEVISION	Leom Fixing Technicien Testile Designing Testile Finishing & Oyelog Throwing Werping and Weaving
	Kame		_AgeRome Address		

## HOW TO FIX ANY CAR



Any tune-up, service or repair job on ANY car can be as easy as A-B-C... when factory experts show you how-to-do-it one step at a time That's why no job's too tough to handle when you've got MOTOR'S brand-new AUTO REPAIR MANUAL at your elbow!

Book "starts from scratch" — tells you WHERE to start, what TOOLS to use. Whether you're a beginner or an expert mechanic—you can "breeze through" ANY repair on ANY make or model car built from 1952 through 1959!

### Everything You Need to Know in 1120 Sig ILLUSTRATED Pages!

NEW REVISED, 1120-Page Edition contains the meat from 176 OF-FICIAL shop manuals — simplified for YOU, 30,000 essential repair specifications on 34 different makes, Mora than 2,850 "this-is-how" pictures. 225,000 service and repair facts. Leads beginners every step of the way. Time-saving factory repair procedures for experts, Instructions and pictures so clear you CAN'T so wrong, Used by

U. S. Army and Navy. THREE MIL-LION COPIES SOLD! Try Book FREE 7 Days

Just trail coupen, tAttach it to postearch if you
wish.) Make Manual
PROVE what it's get.
Unless you agree this is
the greatest time and
work aaver you've ever
seen—return book in 7
days, pay nothing, Mail
coupen to MOTOR Book
Dept., Deak 926, 250
W. 50 St., N. Y. 19.

### Covers All Models —1952 thru 1959

Butch Jeep Castillag Lincoln Chevrolet Mergury Chrysier Mach. Chipper Oldsenabile Continents Packard De Sale Plymouth Oodge. Pontage Educal Bambler Ford Studenasser Hudigh Thunderbird Imperial Willyn

### Same FREE offer on MOTOR'S New Truck Repair Manual

Brand tase! Covers lively job on EVERY popular make gaseline and Diesel truck made since 1932. FRICE 7-Day Trial. Check proper has in coupon



### MAIL COUPON NOW FOR 7-DAY FREE TRIAL

L	(Affach to Postcard it More Convenient)
	MOTOR BOOK DEPT.  Desk 922, 250 W. 55th St., New York 19, N. Y.  Rush to me at once (check hos appeals book you want):  MOTOR'S New AUTO REPAIR MANUAL, If O.K. I will result  f3 in 7 days, \$2 monthly for 2 months and a fitted payment of \$1.55  iplus 456 delivery charges) see month after that. Otherwise I will  return the book postpaid in 7 days. (Fateress price, remit \$10 cush with arder.)  MOTOR'S New TRUCK REPAIR MANUAL, If O.E., I will  result 32 in 7 days and \$2 months; for 3 months, plus 456 delivery  charges with final payment. Otherwise I will return book portpaid in 7 days. (Foreign price, remit \$11 cush with order.)
l	Address
	City

\_\_\_\_\_\_\_

Lingo" [May] attract my eye on the first skim-through. Now then:

The swage. I know such a tool is used to spread a saw tooth, but surely the device you picture is a saw set. A swage rides on top of the tooth to shape it equally on both sides; a set bends the tooth to one side only.

Screeds. I've sold thousands of feet of screeds, but they were two-by-fours to make forms; not a float to strike off the cement. The forms were for footings of buildings in all cases.

Geography may enter into the picture. British carpenters, for instance, install screeds for plasterers' guides. In my locality, plasterers require "grounds."

F. O. SUHRING, Sarnia, Ont.

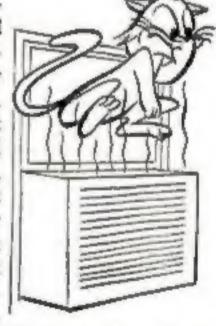
### We've GOT a Lathe

You suggest drilling small holes in license-plate bolts to safety-wire them, and in pliers to make a hose-clamp tool ["Hints from the Model Garage," April]. Did you ever try to do this? These hints must be for lathe owners. They're good ideas, but not too easy for the man with a hand electric drill.

KEN GREENBERG, Chicago.

### Kitty Qets a Champion

THE tip on keeping neighborhood
cats off a windowsill air conditioner
[May] appalled me.
Instead of covering it
with a tack-studded
cover of screening,
why not use a cat
repellent? The cover
would be 100 percent
efficient, but might
bring injury to helpless animals. I be-



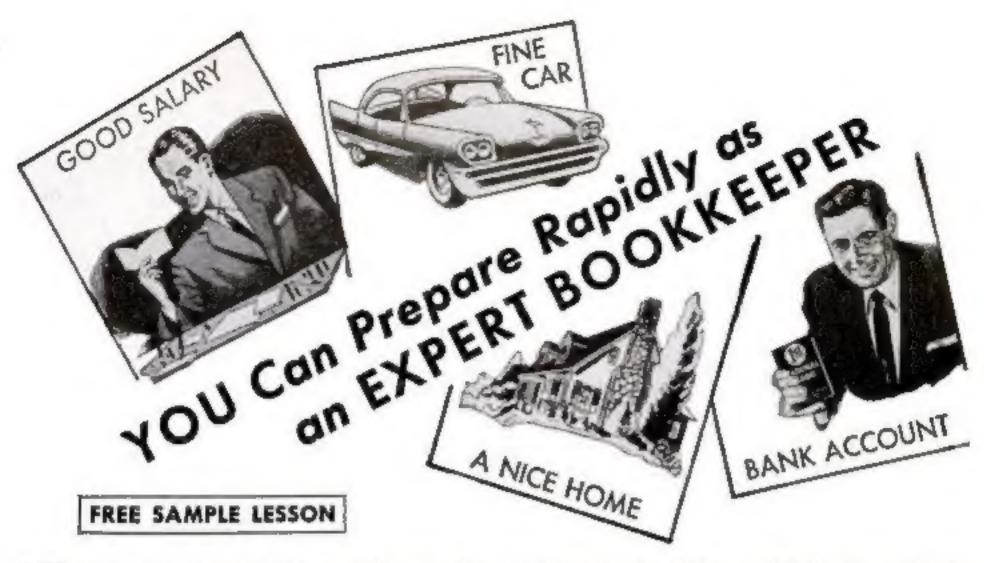
lieve any user would be guilty of extreme cruelty.

CHARLES BRENNER, Bronx, NYC.

### **Hood Light Worries Him**

ONE of the "Hints from the Model Garage" [June] shows how to install a light that turns on when the car hood is raised. There's a serious disadvantage in wiring the parking lights to the ignition switch to provide the underhood light.

If the ignition switch is off, the ignition can still be activated simply by turning



IF that's what you want, here's something that will interest you—a short course to quickly prepare you for your start in a successful accounting career. Not a magic formula—not a get-rich-quick scheme—but something substantial, and practical.

Of course, you need something more than just the desire. So, wouldn't it be well worth your while to use some of your leisure time in interesting home study—over a comparatively brief period? Always provided that the rewards were good and thousands upon thousands have found it so.

A Bookkeeper's or Accountant's duties are interesting, varied and of real worth to his employer. He has important standing with his employer.

Why not, like so many before you, investigate LaSalle's modern Problem Method of training for an Accounting or Bookkeeping position?

Through more than 50 years' experience in training hundreds of thousands of successful accountants, including nearly 5,000 CPA's, we have developed a practical training in sound accounting principles and practices, designed to prepare you rapidly for countless numbers of high-paying bookkeeping and accounting positions.

### You, Too, Can Succeed

The success of LaSalle graduates has resulted from their knowledge and application of the principles acquired through Basic and Practical Accounting, Principles of Accounting and Cost Accounting training, offered in our step-by-step accounting plan. Federal Income Tax is included to qualify you for the many opportunities available to bookkeepers and accountants with this valuable knowledge.

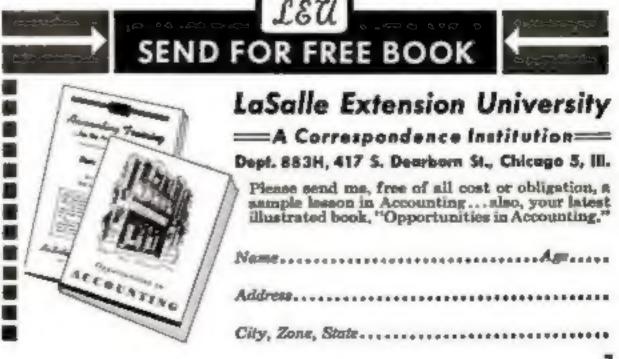
Success in mastering the training is assured through the guidance of expert accountants and CPA instructors. You complete the lessons right in your own home, in your spare time, advancing as rapidly as your time and ability permit. Low cost-easy terms.

Will recognition come? The only answer, as you know, is that success deer come to the man who is really trained. It's possible your employers will notice improvement in a very few weeks or months. Indeed, many LaSalle graduates have paid for their training—with increased earnings—before they have completed it!

### "Opportunities in Accounting"

For your own good get all the facts about this short course in modern accounting training. Write for Free Sample Lesson—also latest book "Opportunities in Accounting." They will prove that Accounting offers a brilliant future to you and will show the wide range of opportunities that exist today. No cost or obligation. If you want a position of higher income and greater prestige... MAIL THE COUPON NOW!

## ACCREDITED MEMBER, NATIONAL HOME STUDY COUNCIL



Carrol tel Isil

the parking lights on (at the headlight switch) and closing the added toggle switch. The car can then be started with the starter, or by pushing.

AL ROSENCRANTZ, Toledo.

You're right, of course. Anyone who knew of the wiring could make off with the car. But car thieves generally shy away from a strange switch, fearing a theft alarm.

### We Use Inversion Specs

When you run a quiz like the one on foreign cars [June], the answers are always inverted. I do not have too much trouble reading upside down, but it is a little slower and I am always in a hurry to get to the next item. I sure



would appreciate it if you'd print your whole magazine right-side-up.

F. M. VANDERVOORT, Euclid, Ohio.

### Accolade for the Tucker

So the Tucker engine was "big and heavy compared to the air-cooled aluminum power plant Chevy is readying" for its rear-engine small car [June]. But you forgot to mention several things:

The Tucker engine was about four times as large in displacement, yet weighed under 500 pounds—less than the

Chevy straight six or new V-8.

Even with 589 cubic inches and automatic transmission, the Tucker averaged 20 m.p.g. at 100-m.p.h. cruising speed—as good as Chevrolet's new opposed-six.

And what's "new" about it? Tucker had everything it has and had it 10 years ago—including fuel injection that hasn't been matched yet by Detroit's gasoline engines. But I'm glad Detroit is finally putting the engine in the rear.

FRED FETNER JR., Columbia, S. C.

### He Says It's Knot So

I'd like to clear up a little misunderstanding on knots ["Navy's New Hitand-Run Undersea Raider," June]:

You say the submarine travels at five or six knots an hour. The knot is a unit



Relax! Drive worry-free on B.F.Goodrich Silvertowns. They're lab-tested, road-tested, time-tested. We do the worrying for you! So have fun. Enjoy trouble-free mileage on the quality tires chosen for new cars year after year. Get top value, get Smileage! 4 tires, \$4 down!

B.F.Goodrich Smileage dealers are listed in the Yellow Pages. The B.F.Goodrich Co., Akron, Ohio.

## B.F.Goodrich Smileage dealers

## NOW READY! McGraw-Hill's New Train-Yourself Course

PERFECT, EA



-even if you've never looked inside a set before!

AT LAST — at Amazing LOW COST — The BE YOUR Most Complete TV-Radio Repair Course OWN BOSS! Ever Published, TELLS and SHOWS How 00 AFTER 10 YEARS

to Do Every Job Quickly and Easily --Make GOOD MONEY, Full or Spare Time in the BOOMING Repair Susiness

TION - McGraw-Hill's new s-Volume Course brings you everything you need to know to "cash in" on the TV-RADIO boom. Over 2,350 pages of money-making "know-how" by top factory engineers and electronic experts. THREE giant REPAIR MANUALS tell and show how to FIX every trouble the easy way. TWO TROUBLESHOOTERS tell exactly WHERE to begin, WHAT tools to use, HOW to "polish off" every job. Complete Hame Study Volume guides you every step of the way, tech how to got ahead fast as a repairman - build up your own business, full or spare time, for BIG PROFITS!

### EARN While You Learn

Tested -- and now used in top achools, and repair shops - Course volumes are simple enough for green beginners, amazed "pros" with new easy methods Starts you doing simple repairs - and earning money from very first chapter, ABC pletures and directions make tougher jobs a 'snap.' Before you finish you can earn many times its rost.

NO previous training needed. NO complicated formulas, PLAIN ENGLISH pletures and directions cover ANY job on EVERY set - tubes, circulta, speakera, new a-c/d-e portablea, Color TV, even what to charge for every 306!

### \$16 MONEY - Spare or full Time

Forget lack of experience. Forget your age. Over 40 MILLION TV sets, 136 MILLION radios - and the shortage of repairmen - mean big money for you. Course makes it easy to "cash in," spare time or full, start your own business, enjoy your work and a big bank account!

### SEND NO MONEY

Try Course 10 days FREE, (We pay shipping!) If you don't agree it can get

you started in a money-making repatr business - retuen it pay nothing Otherwise keep it horn while you learn, and pay the low cost on easy terms. Mail сопров НОЖ. McGraw-Hill Book Co., Dept PS-6, 327 West 41st 5t., New York 36, N. Y.

Examine

### PARTIAL CONTONTS

PROFETABLE

6 BIG

VOLUMES

laciading. Home Course Quilling I

Shows how to Get Ahead Fost.

OFFER SAVES YOU 511,85 I

- Tolovision and Rudes Repoliting Testing, repairing ro-placing paris, 586 pages, 700 placing paris, 586 pages, 700 This is How pictures dia-grams By John Markus, Peature Ed , Electronics Magazine.
- Practical Rudio Servic 64 Emy-10 foliow directions diagrams, drawings - with job abeet for every repair job 599 pages, 473 lines By William Marcus Alex Levy Electronic Training Experts
- Freiteble findin Troublerknoting -WHERE to look and WHAT to do for every trouble. How to avoid coally mintakes, handle customers profitably 330 pages. 153 "how-to" filus. By William Marcus, Alex Levy
- Prelitable IV Treeblesheating— Short-outs to SPOT and FIX every trouble—fast, for big prof-its By Eugene A. Anthony, Serv-ice Consultant, General Sico. Co.
- Ropaleing Rocord Changers . Step-by-step pictures and directions - how to set up service bench etc 276 pages 302 A-B-C pictures. By Eugens Ecklund, Eng DuMont Lab Inc
- Complete Home Course Dutling - Oetting started in television and radio servicing Row to get the most out of your Course How to get shead FAST By John Markus

### McGRAW-HILL Book Co., Dept. PS-8 27 West 41st St , New York 36, N

THIS COUPON SAVES YOU \$11.85

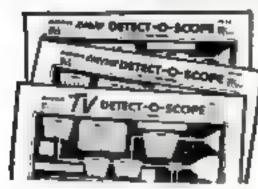
Send me Madrid for 10 pays ratt Trial the 0-Course If okay 1 il remit on y \$4 95 in 10 days then \$5 00 monthly for 5 morths (A total savings of \$11 85 on the regular price of the Course and Detect O. Scopes ) Otherwise, I'll return Course in 10 days pay nothing

also send rate (to many whether or not I keep the Course) the 2 TV, RABIO, and CHICUIT DETACT-O-SCOPE CHARTS. - Lotal value \$3.00.

Name	(Please Print Clearly)
Address	Zone No.

any) CHECK HERE If you prefer to enclose first payment of \$4 95 with coupon. Same easy pay plan, same 10-day PS-6 return privilege for full refund

ALL THREE Valuable Repair Aids: TV, EADIO, and CIRCUIT Detect-O-Scapes (Total Retail Value \$3.00)



FREE - whether you keep the Course or not - THREE amazing DFTECT O-SCOPE Charts. TV and RADIO Scopes enable you to apot all tube troubles in a nifty CIRCLIT Scope spots all circuit troubles. Make fix-it jobs ensier. faster, 16 x 21 inches, ALL THREE (worth \$3.00) yours FREE while they last on thus introductory offer.



## AUTO MECHANICS

A better job with more pay will mean better hving for you. It can mean a fine home, a new car, nice vacations, and good educations for the kids. If you would like to earn up to \$125 a week and more—and be able to afford better living, train yourself in Auto Mechanics. You can do it with CTI showing you how—and you can learn at home in space time!

GOOD JOBS ARE WAITING EVERYWHERE because there are over 60 million cars and trucks on the road—7 million new ones each year. One-third are in the heavy-repair classification. Skilled mechanics are needed to keep these cars operating. You can be one of them—make big money, enjoy lifetime security—even open a shop!

EARN AS YOU LIARN just as many CTI students do. They make up to \$15 a week and more in spare time. Some start their own shops by graduation time, CTI Shop-Method Home training based on resident school practice, makes every step easy.

DIESEL MECHANICS OR SODY-FENDER TRAINING is also yours at no extra cost. A wonderful chance to give yourself a well-founded education. Only CTI gives you this extra choice! Get the facts, Mail coupon.



### YOU PRACTICE WITH THIS TUNE-UP KIT

Kit includes a Compression Tester, a Vacuum Gauge and Fuel Pump Tester, an Ignition Timing Light and a portable steel case. These professional instruments help you locate engine troubles, let you get useful practice. You keep this kit!

**MECHANIC'S TOOLS TOO** 

You'll use these tools to get real experience. They'll increase your interest, stamp you as a 'pro.' You'll earn spare time cash with them. No extra cost for tools—you keep them.



### MAIL COUPON TODAY!

### MAIL TODAY FOR 2 FREE BOOKS

COMMERCIAL TRADES INSTIT 1400 Greenleaf Ave., Chicago Dept. A-1129	
Send your new Auto Mechani Sample Lesson, BOTH FIEE.	cs beek and
Name	
Address	-12-
City	_State

of speed—one nautical mile an hour—so the article should have read simply "five or six knots." Knots-per-hour is a unit of acceleration, not speed.

H. W. SCHWARTZ, Paxton, Ill.

### If You're Reupholstering . . .

YOICKS! I just read reupholstering [June] after I had rewebbed two chair seats. Two suggestions for you:

 The more webbing, the stronger the job. Your photo on attaching webbing

shows three strips used, but there is easily

room for four strips.

2. Always place the back of the webbing stretcher against the chair with the teeth in the webbing. Then in straightening out the stretcher to form a plane with the top of the chair frame, the webbing gets the proper tension without damage to the chair frame.

ABE BRAYER, NYC.

### Fooling the Radar Cops

You say decking a car with fluorescent lights plays hob with radar ["Why You Can't Fool the Radar Cops," May]. Then why couldn't trucks use such lights to display the firm name on the sides of the vans? It would be inexpensive since AC generators could be operated from the fan belt.

C. A. STRAIT, Sebastopol, Cal.

This would work, no doubt. But the lights would also advertise that here is a driver who disregards speed laws.

antenna to one spark plug. The spark—electronic noise covering all frequencies—will be broadcast from the antenna. When frequencies other than that broadcast by the radar are picked up by it, your car will appear to be traveling at all speeds, including reverse.

You can make a radar detector from a neon glow lamp, some insulated wire and a dry cell of just enough voltage to not trigger the lamp. When the car enters the beam, voltage induced in the wire leads will cause the lamp to glow.

RANDALL ESTES, Piedmont, Ala.

VALUES TO \$8.00—now years for only 61c each! Any 2 for \$2.75. Any 6 for \$4.50. We are forced to dispers of present stock at secrifice to raise cash for new imports from Europe? All new, first quality merchandise. Satisfaction guaranteed or mesoy back. Send check,

cash or money sedar. Add only 11e averall to delvay postage & insurance, Check Runs desired right on this page. Priot name & address on white space in the margin. Then bear out ENTIRE page and stall. Hurryl We can guarantee these prices only while stack lasts.

Thoreson, Inc., Dept. 7–H, SSS Water Street, New York 2, N. Y.



### VALUES TO \$5.00! CTOSCOPES



med views at moyers, theates, sports events, dead fine print" documente auc-One Lide file al.

### II-Piace Combination WRENCH SET



The 761. It drop for jet of the property of th One side bos-and, tizes 7 32"-77,6" other side open and, sizes , 3 64" to 1 4" Cur or bosse rapales.

### 6 Stouk Knives



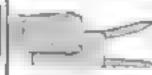
No 10 SIX for 10t. Have, first quality Stanoines, steel Serviced edges Ears & leary but handles. Imported Sournees W Germany One my ion streamy said. Non-50% of

### See Where It is in from W. Germany Dork with Non-Lites



to TSA TS for Well Dan I grope in dark Arted at ecents' & te-L tes slick to any surface, gigo in dark 51 is your got phone, bed, chairs bath dear certar biers. for overhead et: A-te-L-tee recharge themse les during day Big foil of 72.

### Stainless Steel MONEY CLIP



### Built-In \* Stainless Pocket Kaile Steel

No. 68%. Gr pe cormetal it pitch starts you projement y despond Has but I in pocket ande with two blaces Stainiese steel litro-ent Save 66%!

### VALUES TO 55.OO!

Packet Microscope

### from W. Germany,

Ny. 53. Metal detign Ecomica jawamnort teather, traus, etc. W German optics plant ? at des FRFE Thousands prog.

### Electric Magnifier Lights Up As It Mognifiest



Fix, Mend, Report Stop Leaks Fasti RONDPRUF

Z for 350 les, 47 ftrig. 31 g to 8 8 Jack by plumb s & hand-men fast. Manda rubber metal wood, state, crockery £16613013

by fumperature changes. VIII on boats'

### BLACK EAGLE



He. 79. Drig. \$3.50 -70% FRC Bosnel signassions medic Spagnion red center focus. Free smaps. 4 rens cross moorted from W. Germany

### New Wallet has 40 Compartments!



n n 4 4 0 double- L-Ced cinht punts. ments that hold (III pho-los passes Heensen ote OCCUPATION OF THE proof dust-stud safety Sinapopopo SI W Yelle

Mandiom :

### 8-Pc. Toilet Kit with ZIPPERED

NEW LOW



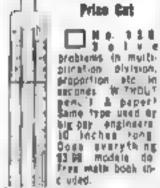
IN. 347 pocket Part 3:5-ded lipper opening Comes with
micror romb out first
c poer, toethbrush brush
ht for supp contained
font-botte & jar for
brades lake on trips.
Not 23:50 Not 17 90

### solt for \$, 50 Bave GIANT PLASTIC



No. 4. .OL sq. feet. thinner gauge die he. des co corer box's huntfor auto seat covers etc W-pes crean a h damp

### 10 Inch Slide Rule & Math Book



Tiny Electric Motor



No 163. Fire pain at hand—give a grant performance loares in 3,600 APM's. Operates on amai battery Di ves the see Hart disc Mt. 11 10 - ace Hart PRICE

### CORK KNIFE It Fluots!



319-81851 greef Can I sone -nan cork handie Double-edge One tire faller sharp for six sy giver bide yer rated for scrab-ing high use two An use un one Sheath included II 00 mahup-men Perce than Mark

Fr All

### fomous Windproof Lighte in Stiff Windl



## 101. Harcanes SICE parts reserve One fundreds of fights Record laire — even m post ming Farefitt P O O A E tord at nighter

### COMBO-MATICI



Me 45. Impacted to get W Carmany Pocket Directions magnified to compass magnified rearing glass, felchiope largeby one sterrosi ope & bun diet ma' b-at Snaps open, fplds 6 11 98

### 30 Hollow Ground Blades for 97cl

Pkut-Die All Bundent

et n. 1311, Not per 日日日日日 +76 3 Why Poor b 041

- M hone sois!

### 6 Ball Point Pens Yours for Only 99cl \* (antyreeff (morpreef)



### BLACK FOREST HUNTING KNIFE 10 menes

□ ₩\*\*\*\*\*\*\*\* mest papu m buntler beste a g massi 0 g mgsat Our rep en onte 90c Sheath FREE Nearty 10 inches ong Use on the ng & humbing to be



Makes 106 1331 Bills for Mic Cuaranteed to 61 Pager Mahi Sc . p. to ather type pers Sold in lais of the tre only Blue leb only

### Thoroson Halesow Sows Any Shoped Hote for Your 'L" Electric Drifft

This whole take Into 36 driff Boto thry wood, prestic cornigs. You saw any that he am the fact sometimes Cat for sometimes righted at the seconds for SI 25 to \$1.39.



### 4-Pc. Center or Power Bit Sett



No 789 6auly 90c Contains beld ber 441 and 1 Inch plantic hat fully pol-nhed La

round shanks, standard length, Grop forged steet,

### 5-Pc. Goggle Kit Cost U.S. Gov'l About \$5



Ma. 229 Four pair of coggien, 2 dath & 2 clear math population hand bison haw never used Cost gov't about \$5-yours for the Use for an army of the post-one, the cost of the cost

### 24 First Quality Camel Hoir Brushest



No. 2226, 24 Camel Hall Brushes for 95c For hun-grees of ittle touch-up jube that big brankes can't properly — creating rifle, machines, pistole, botice, atc Sizes range from Mu. te Sizes I to No. 5.

### Seal Valuable Papers Q-In-1 Knife in Clear Plastic in



246 clippings, papers, atc. In clear plantic with simple finger tip prassure. For manent or removable and Grant 5 time edge 12 4747 should plus bown of 6 5"17" sheets & emp directions. Not \$1 98



scissors, jacknote, and acrendings. Fifs perhet opens in 5 mehet Orig. \$1.35-new Ralf-price.

### 7-PL Karium Steel Packet, Tool Shop!



Me 243 Agreetable wraped an b parely, acram driver an as scrembrood, drill, flat for regards of radio, Ideal TV \$1 %- spore for Mc

### 12 Roof Dalkil



No. 906, Make her little per feet the a princess with those 12 real doils. Made of life-libe plantic life able arms & lees, cressed in differeuf contumer. Clossout hargein,

### S-Pc. Multi-Color Deluxa Dask Set!





Church Home desired right on this page. Any item hog. Any 2 for \$2.75. Any 5 for \$4 pp. Print name & address in white space below. Tear out entire page & mail with payment. Add 12c to delvay gostage & letterance. Serry, no COD's. Satisfaction grav-anteed or money refunded. THORESEN, Inc. Dept. 7-H., BSS WATER STREET NEW YORK 2, N Y. anteed or money refunded. THORESEN, Inc. Dapt. 7-H.

## LEARN RADIO-TELEVISION ELECTRONICS

Servicing or Communications



### Fast Growing Field Offers Good Pay—Bright Future

Bigger than ever and still growing. That's why Radio-TV Electronics has special appeal. The technical man is looked up to. He does important work, gets good pay. Keep your job while training. You learn at home in your spare time. NRI methods have proved successful for 45 years; can provide training quickly.

Add to Your Income Soon \$10-\$15 a Week Extra in Spare Time

"I was repairing Radios by 10th Lessin Now have good TV job M R Lindemath, Fort Wayne, Ind.



many

Doing spare time repairs on Radio and TV Gring arto full time servleing soon " Clyde Higgins, Waltham, Mass.

'I had a successful Radio transic shop Now I m Eug neer for WHPE"

V II', If orkman, II sh Point, N C



extra fixing sets. Equipment NRI gives you brings to life things you study

Find Out What NRI Offers

NRI is the OLDEST, LARGENT home study

earn \$10-515 a week

after enrolling,

NRI Bunkerni

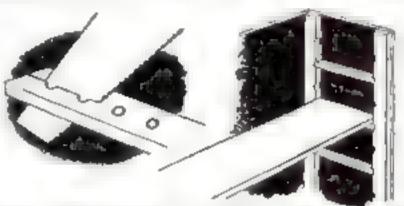
NRI is the OLDEST, LARGEST home study Rad - TV school Mail coupon be by for lesson and 64 pg catalog National Radio Institute, Dept 9HB Washington 16 D C.

### 

### Tip on Shelf Building

You certainly gave us "The Fine Points of Shelf Building," [May]. But I can add a tip on building adjustable shelves:

Drill holes 2" apart, down the center of narrow stock. Then cut through the center of the holes to make two long



strips with evenly matched slots. Apply two strips to each side wall and slip adjusting bars into the slots to hold the shelves. This is so much simpler than dadoing that even a woman can do it.

MRS. I. B. LOVELACE, Santa Barbara.

### Some Inches Strayed In

May I add to the confusion in the minds of readers pondering on the height of Titan, the elephant [June, p. 112]:

By your yardstick, he measures 13 feet 12 inches. In India, they'd have cut down his size to 12 feet 24 inches through sheer jealousy. On the other hand, his habitat being Africa, the Africans would certainly stretch a point and claim that he towered 14 feet high.

J. P. URFER, Bethlehem, Conn.

Blame a napping proofreader. The elephant stands 13 feet 2 inches high—on any continent.

### Flanged Mufflers Old Stuff

I was surprised to read the request for car mufflers and pipes with flange connections for easy replacement ["I'd Like to See Them Make," May]. What is that guy driving—a Model T?

My '56 Buick has such mufflers and either of them can be removed in about five minutes without even jacking up the car to lie underneath it.

H. E. BALLANTYNE, Miami.

. . If Mr. Curlee is really interested in having flanged mufflers, tell him they're standard on Buicks since 1955. He can buy replacements from Montgomery Ward. They match perfectly.

A. BRUCE THOMAS, Baltimore.



### An old industry affers bright new apportunities

Almost any industry has jobs for men with special skills. In many cases, good pay and steady work are the rule. Yet-would you be happy in being a repairman all your life? Wouldn't you rather have a job that presents a challenge-still bigger money-an opportunity to grow!

Listen, if you are ambitious to keep climbing: The air conditioning and refrigeration industry is growing so fast that 20,000 newly-trained technicians are needed each year, They can come only from the technical schools. Because installation and repair work is important, graduates may expect high pay and security right from the start. That's not all. A well-trained technician has a great opportunity to develop into a Service Engineer. As a matter of fact, 90 percent of all refrigeration engineers are former repairmen!

If you seek a career, not just a job, get into air conditioning and refrigeration. Your first step is to gain skill and knowledge. Learn at home by practicing with 25 big kits that CTI sends. Acquire experience as you train.

23 field-type projects—do 10 trouble-shooting jobs. You make home a training center!

So practical is CTI training that many students earn extra cash in spare time soon after they start. They make calls on their own, or get part-time jobs with local appliance dealers or air conditioning contractors

But read the complete story. It is told in a new CTI catalog. Just fill out and mail coupon below for your copy. Sample lesson included. No cost nor obligation-Commercial Trades Institute, Chicago 26, Ill.

COMMERCIAL TO	ADES INSTITUTE
CHICAGO 26, ILLUNOIS	DEPT. R-626
Sand untalon, Socray by Afr Comficient Locane Sample, Buth FREE,	jog & Bufrigurytips, and
H-1	
Althon.	
Cit7	

# ...have you heard...?

How to outwit bugs: A couple of Cornell entomologists have compiled some tips to help you cope with the pests that swarm at night, or attack in the garden or on the beach

First: Know the enemy. There are stingers and biters. Stingers attack out of sheer cussedness and won't be put off by repellents. Biters are after food, so their appetites can be blunted by chemical odors.

Wear proper camouflage: White or light-colored clothing bothers the stingers least; darker hues, most. (Beekeepers say this is a major factor when figuring the odds on being stung.) On the other hand, biters dislike smooth hard-finished fabrics so you're safer with khaki, drill or nylon. Both types are irked by textured tweedy fabrics, leathers and suedes, and thus more eager to attack.

Don't be siceet: Hair oil or perfumes attract bees. For an obvious reason: They think you're a flower.

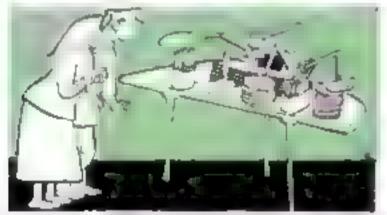
Be brave: Act coolly. Don't move a muscle. Biters and honeybees are more



inclined to charge a moving object. To flail at an oncoming bee is the worst thing you can do. Judiciously place your hand in front of your face and beat a graceful retreat.

Russians may be impressed by U. S. automation—homestyle, in the American National Exhibition that opened last month in Moscow. Among the exhibits:

 A self-propelled serving cart. It slides out of its niche in the wall, moves to the dining room to deliver silverware and plates. After dinner it is stacked with



dirty dishes, takes itself back to its hiding place where it disposes of the scraps and washes the dishes.

 A "mechanical maid." Operated by battery, this one leaves its hideaway in the wall to scrub, rinse and dry the floor. Then it goes back home, recharges itself.

Both these are remote-operated appliances that move in preset patterns, Whirlpool is the manufacturer.

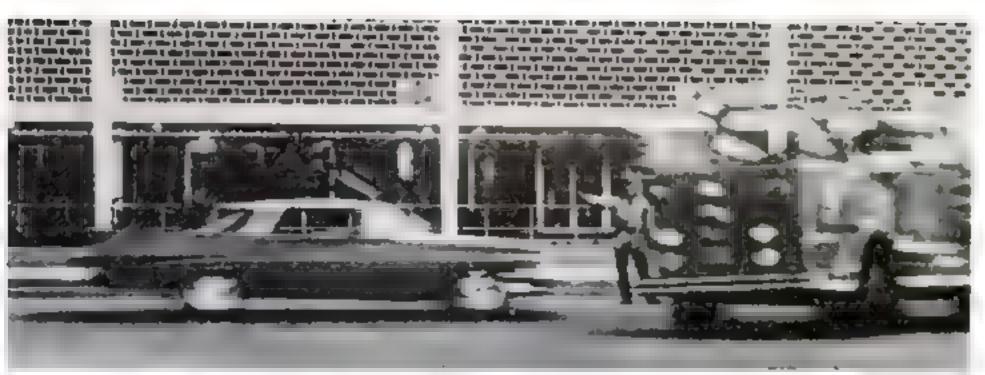
On the home front, manufacturers foresee more robotry within the next decade:

- Building bricks with thermoelectric elements built in to cool the house in summer; warm it in winter.
- Closets in which clothes would be dry-cleaned ultrasonically overnight.
- Remote-controlled stoves: A small one-channel transmitter operated by pushbutton would enable a housewife stuck in traffic to alter the temperature of a roast in the oven.
- A five-in-one laundry machine that washes, dries, sanitizes, presses and folds shirts and linens.
- A freezer-cooker that automatically moves food from the freezer to the stove, then cooks and serves it.

Are you a stickler for details? Plod along at a job setting your own pace rather than trying to keep up with half a dozen others? Take boners in your

stride? Then you may have the makings of a "creative" scientist.

That's what Science Research Associates, a psychological testing firm, found



Pirentons tires deliver stapping power you need for today's driving.

### FIRESTONES GIVE YOU NEW STOPPING SAFETY...



Firestone tires too the mark in unto proving grounds emergency feeting.

## and this competitive braking test proves why!

Firestone Rubber-X\* assures longer-lasting, skid-resistant safety.

That's one reason Firestones set the pace on automotive proving grounds where a tough testing program appraises original equipment tires. Here automotive engineers push tires to their limits of endurance. Under hurtling high speeds they measure Firestones for traction with heart-gripping "panic stops." They look for sure-footed safety on both wet and dry pavements. Through these and other comprehensive tests, they compare tires for safety, quiet, comfort and a dozen other factors that affect your driving. From firsthand experience, they discover which tires meet the exacting standards of the world's most competitive industry. That's why so many new cars roll off assembly lines on Firestone tires. Next time you need tires, remember this track-tested performance of Firestone Rubber-X—the longest-wearing rubber ever used in Firestone

tires. Buy now, on convenient terms if you wish, at your nearby Firestone Dealer or Store.



Copyright 1959, The Firestone Tire & Rubber Company



<sup>\*</sup>Firestone Rubber-X is compounded specifically for each type of ear, truck, form implement and construction equipment tire.

### ...have you heard...?

out when they studied men in the field. They picked 67 chemistry Ph.D.'s from three big companies. Of these, 33 were "more creative": 34 "less creative"—



with creativity rated by the number and quality of ideas, novelty of methods, and ability to communicate results. Their findings give the lie to the stereotype scientist of shaggyhaired, baggy-tweeded, egg-on-his-vest vintage:

 The average creative scientist is in his mid-thurties. He's well-adjusted and efficient.

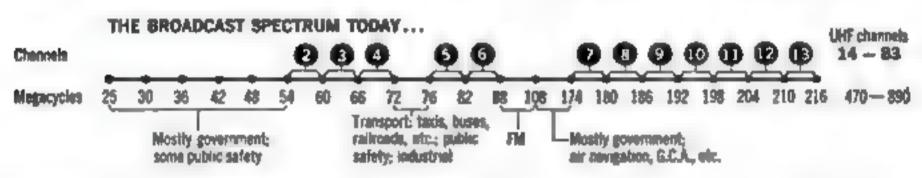
 He follows his impulses and drives himself hard.  He works slowly and cautiously at first, then picks up speed as the idea jells.

He worries less, is not so conventional as his less-creative colleague. He's not so likely to let personal or social problems interfere with his work.

 He's more dynamic, articulate and independent—sees himself detached from others.

In contrast, the less-creative man sees fewer possibilities in his job; thinks there are outside forces restricting his potential. He's more apt to think it's a weakness to pay much attention to detail. He's more likely to shirk blame for mistakes.

But on one point both agreed: When asked what would most stimulate their output, "substantial salary increases" topped the list.



"Hey, what's on Channel 90?", you may well ask some day. But first—a battle smolders, grows hotter, inside the Federal Communications Commission. The Problem? The shortage of television channel space. The Solution? Easy—add more space. The Battle? How?—without offending local stations, or the military, or you—because your TV set would become obsolete.

At present FCC establishes a 170-mile distance between stations broadcasting on the same channel; 60 miles for those on adjacent channels. In New York you're lucky. You get to choose from seven different stations. In Dayton you're stuck with two: one on Channel 2; the other on 7. Room for a third could be found if the nearby Indianapolis Channel 13 station could be limited from its 170-mile to a 100-mile range.

That's a proposed "interim" solution. But chances are the Indianapolis station won't like it. It means limiting its advertising potential. Other critics say the reduction to 100 miles is just a stopgap plan that'll delay what's really needed: a basic revamping of the whole broadcast spectrum.

Long-range planners are studying five proposals:

1. A 50-channel system using today's 2 through 12, plus additional space. This would provide at least five stations (four commercial, one educational) in each major TV market.

2. A 50-channel system retaining 7-13 but dropping 2-6. (The gap between 6 and 7 is the FM bandwidth.)

3. A 25-channel system retaining 7 through 13.

4. and 5. Retain today's VHF plus UHF system, or switch to a 70-channel all UHF system. These two seem unlikely because UHF is such a dud.

But to get more space FCC must deal with the military. It's unlikely they'll forfeit all the space FCC wants. But a compromise deal will have to be worked out—and soon



This Big Proceed Book gives full intermerous, with meriting diagraphic egypter age the proscriptor constitution hash, ugustical, her view and repair all mostern cars, crucks and buses.

Diesel Engines, Hydrometic and Find Drives Fully Eagle-ned.

A complete guide

A complete gode of 1898 Pagen, or 18

CHICLE No. 1 HE COUPON

MOME APPLIANCES PREEZEMS FIFE GERAIOM

OGTES.

Many when GAS AND EXPERTE APPLIANCES Handy Reference toe Cherric & Gat Borenumers. Explains tently and amply how to hingle bruhes, how so test its semble and connect Wir og diagrams. 1000 Pairs. East to cook. Answers ALL yout questions. 864 Pages. Has in rel. Only his.

CIRCLE No 2 IN COUPON

BANGIS



### TELLS HOW TO ANSWER RADIO LV.QUESTIONS SERVICE LIBRARY

MARC 12 LATE INFORMATION IN A MANDE FROM FOR BACKS AND TOLENAME AND STUDENTS.

TWO COMPLETE VOLUMES -1508 Page - OAS I Sections and Degrams 100 Impostant Parts and Figures on Med in TV Barra I've on De set INCLUDES TRANSIST BY & Transcrop Co Part Bernheit De set Changets. PA Systems Phenograph Pale ps FM Auto Bailo Diver Wave,

Date pan get. Dem. Repairs. Trauble Securing How to pet Sharp, Clear TV Parante Trained Arrest, Plan to Test Explains COLON BYSTEM's Mesheds of Concernme, Tables, ptg Included C. en High Preparate Oscile. reference of lefe at a home study course. Only 18 for

CHELE No. 3 IN COUPON

YOUR TRUCK NOW

The TRUCK & TRACTOR CL. E for Merhands & Defers. Foresters, Garagemen Halpers, Defert & Trachle theretally, Factories are Cor one Got & Diese Maint Pro-ciples - Construction - Operation - Description - Managements will appear - Brokes Harve, for 1 all Parts 1374 Pages Ft, LLY HILUSTRATED Index Only St.

CHICLE No. 5 IN COUPOR

## TTERS GUIDES



Process? Trade Assessat & Reference to Explants in plan largered and by cloud allustrations, diagrams where graphs and a larger the pricing of madern plants of pricing and Art Conditionary & Yok = 25.46 Pages 1542 Diagrams & Theoretical Colly Be for the emorphote set of 4 wals.

CIRCLE No. 6 MI COUPON

### PAINTING & DECORATING MANUAL

laugh Trade information as outside and intends muck, how to mad punish projections of outlains, paper hanging wond families brain synthetic panels reloc a by rules have been people while providing a state of the rules have grade to resist better positing and decompling, 454 Pages. Fully Effectively Only 22

CIRCLE No. 7 IN COUPOR

### EXAMINATION FREE

EIND NO MONEY Fuy the pastrons torhing We are plad to send you say of the Audel Quides for obsolutely FREE supplementation in visual many horse. We take all the either and trave all the documents up to YOU There is no old gobont It you decide to keep the books of your choice you have pay for them under our estuarting may pay plot of only \$2.5 month

HERE IS ALL YOU DO

THE EASY TO ORDER In the No. And Mart Order Company at the sight just draw a certic around the new har of Audel Quides you next us to tend you for FREE EXAMINATION We will mad them to you of more to help you heald a languing future by marrialising sour EXILL is less any reason at all year are not COMPLETELY east-fled, rerays the hopky to us, and that well and the matter? MO STRINGS ON CATCHES TO THIS OFFER.

THEO. AUDEL & CO. 49 West 23rd bread, New York 16, N.Y.

## LDERS GUIDES



PRACTICAL STOREHOUSE OF M. LEAN CONSTRUCTION IN FORMATION 6 and set for terperact and all mentumbers Ex-

darporters and oil academiched Ex-place in run language and by pre-late theorems processes after the short on the do a run of hands on the DI M EST interruption. Val. 1-Timbs short liquities now the long posters from the Val. 2-B. the to market and true the Val. 2-B. the to market as a drawing plant age of quarter arterists with Val. 3. Hands and rund from ag-laying up to the state of Val. 4-e Digits is at on algorithm the Strag for mark parking out 6 wit. 904 to pure ag one & wit 904. 1700 littletratume Winds are Page | | paly St

CHICLE No. 8 HE COUPON

### PRACTICAL ELECTRICITY

A COMPLETE MANDBOOK Quick a mighted mode not run in Complete ser no sen god practical information on the rules and loss of classically. Maintenance of Machinete AC and DC M. ors. Armanures. Make Department Mouse Lighting Passes Wiring Materia. Batteries. Turks formers. It Simple to amprehensed 1520 Pages. 1600 Historia pages.

CIRCLE No. 4 W COUPON

THERE IS TO AN W ABOUT M HERM DESEL ENGINES Bear promptes starting to re toward by the compression of removements, do tion to be to the state of the

WELDERS GUIDE Come Bloom Depart melding for short me all spot and pape wells, givened yet as a and about hors, upper brane female and asher metals a retend with soften bardining, bard in ing. Cutting A tyline work sorters hard-ning, hard in ing. Cotting, breiting our 606 Pages Fully Illustrated Only Ed.

CHICLE No. 10 IN COUPON

### MATKEMATICS MADE EASY



A COMPLETE HOME STUDY COL REE-Blacking with the first generalist of nd nation were by states of marks

poli igname for for housel and ob frequencies blue BASV record Buthods. In chades place and acid presently biguinatedly high ve calleging at Proc. at test influence lightly and data. How is not able rule. I Pages 150 libertaining Procedul unity 23. CHICLE No. 11 IN COUPON



MISTERN MACHINE SHOP PRACTICE I PRACTICAL SCHOOL IN ONE Was bridg cover to record To the how to not up and appropriately presented southing markets. PLETE INSTRUCTOR AND REPERFICE BOOK 3738 Pages Fully I instruted Provid at anto 16.

CHECKS No. 12 IN COUPOR

### WIRING DIAGRAMS

This book gives the practical facts on overing all about call apparatus. It avaitant clearly and StMPLY from to wise apparatus for all its do of the friends. Each diagram is duting too and self-explaining. Hand your MOOK 17261-304. Pages, Blussmand, Citig 50.

CHCLE No. 13 to COUPON

### REFRIGERATION AIR CONDITIONING

Frit. H. BOOKS TN ONE base praciples, with one operation, because of 3 House held Refrigeration ? Spread Refrigeration in Casts 1 Commissional in relating Refrigeration in the first Condition of Statement & for Condition of the commission of the condition of th

CHICLE His. 14 III COUPON

marghest because the fundamental principles, fishes and or

A COMPLETE COLLEGE INUCATIONS

Fully University with diagrams and shatches, estraindens and tables for ready trieves w Questions and answers. Tradtern by practice study and severe. All found on the re-

Wat 1-Prescribes and release of objects o magneticus, genganical, reports. No. 23

Vol. 1 Dynamic, DC Ma-tors country int, opposit-tion, consistences etc No. 16

Vol. 3-Tomag marginesis and costs, starting bittery contr. and reports. No. 27

Vat. 4 - Afternooning controll, power for our at remainds, transfermers, No. 14

Val. 5 - A.C. Moster, treadings maintenance concerners, tours, our No. 19

tention, plans, code, 696. No. 31

Val. & .- Rachenya, pignala, elementari, ignemm, atc No 22 Vol. 9 - Radio, triephoto, belegenph, traveline, mount provides Ha 13

Vol. 10 - Refragoration, (Su-stream tion), welding, a tay, electronic apphanent, ledon, No. 24

7,000 fully illustrated pages. Priend or early \$30 for the Correct SET Also sold imple vidently for \$3 such.



### ALL TYPES OF BLUEPRINT READING

How to read ecutes, the standard symbols, detail and ann bis prints on hing 4 on 20, their site holps hints and temperature. THE MAN WHO CAN READ BLUEPRINTS 25 IN LINE FOR A BETTER JOB. This book gives you the tester language step by step in copy stages. 445 Pages. Very Subj. Discrepance Prince of 1.7

CH & NE TEN COUPON

## ads 2

persons based on meadors printed to the control point.

One in both is figure and about to control point.

One is the track, her kinging besiding dringes Vol. InBoth townshimms, or her, the petting extensions, Vol. InCase are entering, plusing latent, rate would study Vol. InPlantaneous plusion managers also control to the bespectite
of Vol. 1 and Pager 2014 (distinguished Complete but only 18.

CHELL No. 14 IN COUPON



ELECTRIC MOTORS
THIS GUIDE covers the remetivelens, feath
spe. Just Fed. requisiterative beid trouble shares
tog of all open of residen Textureles agreeated mps. dust red maintenance had brought aboutngs. dust red maintenance had brought aboutng of all goo of molecular Technolog armetises
anding Explanat on its subject in grant detor a subject inagency Deer 1016 Pages of
judernapean 612 Pagesons All types of motors (ulty clinic
texted and undered for ready references Presid of only \$5.

CIRCLE No 37 IN COUPON

### OIL BURNERS

Now rempires explaining in detail both domestic and stroke to set burners inchartests and reduce to all harvers for chartests one hard age and terring fitte graves. Fully receiving the theory mul-let receive manufacture specialists, terring, were and and report of all equipment In-dened but ready reference. Over 61th Pages 328 Discorphisms and Disgrams. Only 62





### ADDITIONAL IMPORTANT

The following Aude Guides are all the best in their helds, existen in least appele last-one all the obly ellest-ared Circle site purchases are ben for PRES EXAMINATION FOR STREET APPENDENT ON THE PRES EXAMINATION FOR SET 18 STREET APPENDENT APPEN

MA 21 MECHANICAL DESWING GUIDE 197 Pages No. 22 MECHANICAL DESWING AND DESIGN.

to 32 ACTIVATE AS DRAWING AND DESIGNA AND PROPERTY OF THE PROP No. 41 HOUSE REATING BUILD HIM Pages

### COUPO O-RISK TOD

	8		۳	3 (	6 6		
49 W. 23rd Sweet, New York 10, St. Y. Pierry mail on the 7 days' PRES EXAMINATION die Smelte I best rierbei at st.	AL.	7			10	99	
I agree to make \$2 on I days my upon hank or not probved, and in further must be must be not upon begin or not undered until I have paid the partition prove, plus shape page. If I am not example toly matched with day fields Quades I may return them.	-	62	13	10	13	10	
		47	10	14	20	21-	
PARAMIT		22	10	14	25	20	
ADDLESS.	_	27	30	34	20	33	
OCCUPATION	_	10	33	34	35	24	
SAVE SHIPPING COSTS! Check have if you and see complete a most with under We pay perhaps always. You have store settern privile.	rgo.	27	***	37	40	en	

## for the space 🛶 science eral see satellites. Moon rockets close-up

See the Stars, Moon, Planets Close Up! 3" ASTRONOMICAL REFLECTING TELESCOPE 60 to 140 Power-Famous Mt. Palemar Type | Am Unmonel Baryl



Assembled Ready to use You'll see the Rings of Saturb, the fascinating planet Mars, buge craters on the Moon, Star Clusters Moons of Jupier in detail. Galaxies Equatorial mount with lock on both ares Auminised and overcouted 3" danketer high speed f/10 mirror Terescope comes equipped with a 50% eventers and a mounted Barlow Lens, giving you 50 to 160 power Low cost accessory eyeptace available for I s r Dour s. An Opinia Piblict To employe a ways to essent al. in also included, Sturdy, hardwood, portable tripod, Valuable STAR

CHART and 272 page "Handbook of Heavens."

KNOW THE TRUTH ABOUT POWER Telescope and mineral Telescope will perty will confirm that an Astronomical Telescope will unity give you , ractical fellers to a next so are 13 times per linch of all sective diameter—powers allowed that unity produce amply magnification, make sometime difficult and unsatisfactory.

41/4" ASTRONOMICAL TELESCOPES

270 POWER!



With this scope you can see everything an above but with greater power pins will aplit. Her stars, Mirror has twice the light of the tree power Mirror guaranteed in the tree eat 1 mit of testing and lines and pinion focusing hardward tri 

Same Telescope as above but equipped with Electric Clock Drive-

### BINOCULAR-TO-CAMERA HOLDER



For Exciting Telephore Pictures.

Re not distant fine to 7 mine meaning with a st norm contage. There is no many with a st norm contage. There is no many many and told part of the fine may range whose of the standard and be related as a standard white property of the standard white for most of Take color of that any rate photo a stock No. 70.721. May sat the financial. Stock No. 70.223-N .... \$11.60 Postpaid

### Terrific Buyl American Model OPAQUE PROJECTOR

Projects illustrations up to 3° x 134° and enhances them to 4 ft. wide. No film or n sats on new 1. Projects charts, dissirants pictures project a set of project and the control of the c



difference.

### REPLICA GRATING—Low, Low Cost

Take Unusual Color Photos at Might!

It's here if or accades of proof Reph a trailing—
in them of very we passe. It eaks up white sight
if appet both D True on Graing has been used to
answer more used by a sour he structure of the mater a word and the un verse than one o her a rate
a word and the un verse than one o her a rate
and the investigation of the maintaine of the mater a word and the universe than one o her a rate
and the investigation of the maintaine of the protector

102. M. Includes 2 week B x 5.45°

type. 3 reflecting appears

puch targe + ze-Stock No. 30 202 N transmission type. I reflecting ape

GIANT MAGNETS! TERRIFIC BARGAINS!

War Surplus -- Amico V type Horseshoe shape Tremen total lifting power 5 b size litterinous - A-3% D 2% C 43/.8", D-1% E-1%; F-2% Strength in about 2.000 Gaunt. Will lift Over 125 lbs.

Block No. 70,183-N \$3.50 Postpord 15% lb. size. Approximately 5,000-6,000 Games rating. Will lift over Thu.

Stock No. 85,088-N. Gh oping est. 23 .bs

\$22 50 P O B.

### BARGAIN-PRICED STETHOSCOPE FOR HOBBYISTS, SCHOOLS

A real stethoscope at helf the usual cost. Idea, for homo craftsmen, hobbyiats schools children Listen to running machinery. Check on hard-to hear motor no hear leakage of gas, air or find Pick up heart beats of animals, insect noises other unhourable sounds. Spichdid for experiments consecutive made anima, husbandry Hours of educational fun for add to students and children for subtractive made to etand heart use.

projects Sens tive, yet sturdily made to stand hard use Stock No. 50,223 N. ......\$2.95 portgald

### Take Telephoto Shots Thru 7x50 MONOCULAR

This is fine quality American made in strument war our us At only by of general observation with do and and to take fact attent to incertain or a languages a bargain of a policy of the colors of the c of cight Steck No. 50,003 N ..



уныг сливев ther three our Included \$15 00 Postpaid

### INFRARED NAVY SNOOPERSCOPE— WAR SURPLUST

Gevt. Cost \$900-Only \$39.50

Converte infrared to visible light, See in total darkness, Use in lab, factory, elegations, etc or distinctly for fine upitest parts or power source. Completely portable. Operates an two flashtichs betterles. Rize 111/6" a 2" Weight a th lately or blace corry the case 12 by image not as abserp as our 2.5% Six procupe—and up

intrared light approx is furnished (see below) Stock, No. 85,098 N . \$39.50 t.o.b. Harrington, N. J.

### INFRARED LIGHT SOURCE AVAILABILITY!

You will need a 6 volt transformer or 6 V auto battery to Stock No. 80 035-W .... 

BUILD A SOLAR ENERGY FURNACE A fuscioating new field. Build your own Solar Furnace for experimentation—many practical uses. Easy! Inexpensive! Use perspected We furnish instructions. The sun powered furnare

will generate terrific heat- 2000" to 3000". Fused enamel to metal. Beta paper aftame in seconds I se our Fremet Lens-14%" diameter, . . f. l. 14"

Stock No. 70-150-N

### ERECT IMAGE LOW POWER MICROSCOPE 5X, 10X, 20X

\$80 00 Value - Only \$19 95

Ratremely standy with rack and pinion froms-ing color corrected optics, turnable microscope body for inclined viewing three different powers long working distance under objectives sufficient eye relief for easy viewing. Made from war surplus optical instrument so that you actually get \$80 00 of value We gha 4 lbs 1 1 high 10 DAY FREE TRIAL Accessory obectives available for powers of 15X 30X 40X

\$19.95 Portpald Stock No. 70.172 N

### HAND SIGHTING LEVEL

Described in Pagelar Machanics March 1859 (sson, page 212 Sight it like a Telescope. Gives you a level line of sight, for lating out gardens, drives, new construction, direbes, etc. Complete Instructions Included. Block No. 105 N



\$2.50 peatpaid

### FREE CATALOG-N

ARRINGTON, NEW JERSEY

100 Pages! over 1000 Bargaine!

America a No. 1 source of mipply for experimenters, bobby ests & maplete line of Astronomical Telescope by to and asset Bird Telescope. Also huge secretion of letters prisons, was part in optical mater ments, parts and access the Te, see per, much acopes, satethite scopes. I'm a new, infrared maporacopus, science, experiment frems, etc.



REQUEST CATALOG-N

OBSER BY STOCK NUMBER . . . SEM GROER WAR SATISFACTION GUARANTEED!

## The month in science

Desalting sea water by adding salt. Simple Simon's method of carrying water (in a sieve) seems reasonable and well thought out compared to the U. S. Department of the Interior's plan for getting fresh water out of the ocean. They're going to do it by making the salt water saltier. Strangest of all: It works.

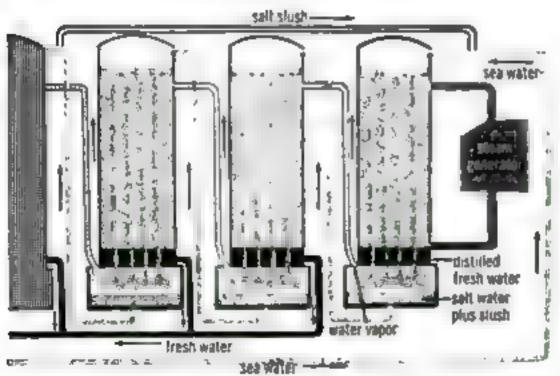
The country's first "saline-water demonstration plant," to be built next year on the Gulf Coast, will use a desalting process called long-tube, vertical (LTV) multiple-effect evaporation. It is an economical process (\$1 per 1,000 gallons of fresh water now, with a 40-cent rate hoped for) largely because it avoids getting the works clogged up with scale. That's where adding salt to sea water comes in.

Anybody can make fresh water out of salt. Just boil the salt water, then cool the escaping steam to condense it. The result is pure water, all its salt left behind in the pot. But the water in the pot, continually boiling down, gets heavier and heavier with salt, and solid crystals form in the pot. That's scale. It builds up so fast that it soon clogs the works. You have to shut down and hack out the scale. And that's expensive.

The LTV process is an old standby of the chemical industry. The principle: A solid crystallizing out of a solution prefers to form on a solid crystal already there. If you put a "seed" crystal into a saturated solution, it grows larger as molecules leave the solution and solidify on it. So scale can be kept off the pot by

providing seed crystals for it to form on instead.

### LTV Sea Water Desaiting Process



That's just what is done in the LTV desalting scheme. Salt crystals are added to ocean water so that a slush of salt and water goes through the distillation towers. Salt crystallizing out as pure water is boiled off, accumulates on the słush, not on the equipment. The slush is pumped through a filter that takes out the big

salt crystals, then put back in at the inlet for another go-around.

The desalting plant will consist of a number of towering cylinders. Each contains a bundle of a hundred or more vertical tubes (sketch). Ocean water, with salt slush added, is fed into the top of the tube bundles. Steam surrounds the tubes, boiling the ocean water so that water vapor comes out the bottom of the tubes. This vapor goes to the next tower to heat those tubes and boil the slush inside them. The vapor that does the heating now is not steam—it's below 212 degrees. But it makes the slush boil be-

### The month in science

cause pressure inside the second tank is reduced (by a vacuum pump)—and, as housewives in Denver know very well, lower pressures reduce the heat required for boiling.

This process is repeated in tower after tower: salt-water slush boiling at ever lower temperatures (and pressures), the vapor going over to the next tower to heat more salt water, some of the vapor giving up so much heat that it condenses to liquid water the sweet water that you want.

The LTV plant is one of five "demonstrations" to be built in a \$10,000,000 effort to relieve water-short areas of the U. S. (see PS, March '58 and this issue, p. 69). Plant number two, to be built on the West Coast, will use flash-distillation—boiling at very low pressures—with heat coming from an atomic furnace.

Shake those piles down. The Russians, not content with shaming our rocketmen and dazzling our dance audiences, have now shaken up our foundation engineers—the guys who install big piles and caissons for bridges, dams and skyscrapers. Literally.

American experts attending a seminar at Princeton University watched a movie run off for them by a group of visiting Russian engineers. It showed a golf ball vibrating in a jar of sand. As the ball wriggled, it sank to the bottom of the jar. The meaning sank in, too: The Russians had figured out a way to drive piles by vibrating them. The vibration method does it five or six times faster and much cheaper than banging the piles down with huge steam hammers, as done here.

The Russians use electric vibrators: motors with unbalanced weights on the shafts. Rev the motor up and it shakes wildly. Whatever it is fastened to shakes with it. If the vibrator is fastened to the top of a pile, it sets the pile wiggling down into the ground, much the way you ease a garden spade into the earth by wiggling it. The scheme works to set or remove column piles, sheet piling (corrugated steel that confines dirt around excavations) and big concrete caissons.

Vibrators are widely used in the U. S., but mainly to make bulk materials—wheat, sand, coal—flow out of railroad cars and factory hoppers. The vibrator is fastened to the side of the container and shakes it so that the contents won't clog.

How come nobody here thought of vibrating piles down? Prof. Gregory P. Tschebotarioff of Princeton, who was the Russians' American host, says that Americans have toved with the idea but never got it to work right. The Russians did, he thinks, because they have supported long-term research on vibration, with many experts from different fields plugging away steadily.

The Americans' chagrin at being confronted with the simple technique startled the Russians. They thought we knew all about it. They have been vibration-driving piles for five years, even described their methods in 1957 at a conference in London.

One Russian engineer, talking with an American colleague at Princeton, wisecracked: "Your intelligence agents in Moscow are so busy hunting military secrets they don't take the time to stop in the street and watch a construction job."



## INVENTORS

Learn how to protect your invention. The U. S. Patent Laws provide that any new and useful art, machine, article of manufacture, or composition of matter, or any new and useful improvement thereof, may be patented if the act of invention is involved. Therefore, every inventor with a valuable invention should take advantage of the Patent Laws and proceed for patent protection in order to safeguard his rights.

A patent gives the inventor the exclusive right to prevent others from making, using, or selling the invention claimed in the patent for a period of seventeen years.

The Patent Laws were enacted for the benefit of the inventor to give him protection for the features of his invention which are patentable. These features must be properly and concisely set forth and claimed in a formal application for patent, in order to comply with the requirements of the Patent Laws. For that reason, unless the inventor is familiar with patent matters, he should engage a competent registered patent attorney or agent to represent him. We are registered to practice before the U. S. Patent Office and are prepared to serve you in the handling of your patent matters.

A specially prepared booklet entitled "Patent Guide for the Inventor", containing detailed information with respect to patent protection and procedure, together with a "Record of Invention" form will be promptly forwarded to you without obligation upon request.

### CLARENCE A. O'BRIEN & HARVEY JACOBSON

Registered Patent Attorneys

92-H DISTRICT NATIONAL BUILDING WASHINGTON 5, D.C.

## ELECTRONICS ELECTRICAL NEERIN

At MSOE, you can equip yourself for a career in many exciting, growing fields: MISSILES . RADAR . AVIONICS AUTOMATION . RESEARCH DEVELOPMENT . ELECTRICAL POWER - ROCKETRY

When you graduate from the Milwaukee School of Engineering, you are pre-pared for a dynamic career as an Electrical Engineer or Engineering Technician. Under a faculty of specialists, you gain a sound technical education in modern, compietely equipped laboratories and classrooms. As a result, MSOE graduates are in great demand and highly accepted by industries nationally.

At MSOE, you will meet men from all walks of life and all parts of the country — some fresh out of high school or prep school others in their twenties veterans and non-veterans.

You can start school in any one of four quarters and begin specializing immediately Engineering technicians graduate in 2 years with an Associate in Applied Science degree, For a Bachelor of Science degree in Engineering, you attend 4 years. A 3-month preparatory course also is available.



### FREE CAREER BOOKLETI

If you're interested in any phase of electronica, radio or television, be sure to look into the programs of study offered by the Milwaukee School of Engineering. Just mail the coupon.

### MILWAUKEE SCHOOL OF ENGINEERING

Dept. PS 859, 1025 N. Milwoukee St. Milwaukee, Wisconsin

$\mathbf{Plet}$	se send	FREE	Career	Bookle	d. I'm i	interested	ic
	Electron	ICS	Electro	cal Pa	ration if	1 Televani	MARI
	Mechani	cal Eng	meering	, A	ladio 🔲	Comput	eri
	Electrica	d Engar	mering	al la	dustrial	Comput	ΙΈ.
			BLCACK.	DESCRIPTION OF THE PERSON NAMED IN COLUMN 1			

	FALSAR FRIDE
Name	Age
Address	
City	Zone State
i I'm el	ble for veterans education benefits

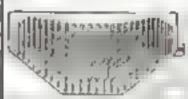


"Hoppy" SPLIT-IMAGE TRANSIT The Most Revolutionary LEVEL& INCLINE MEASURE Ever Model

This simple yet amaxing y accurate instrument and cales level and measures incline down to a fraction of an inch. Makes bush a type or atomy levels obsolete. It not on y indicates level had anyet supplied with it can be exceeded with one pursue using the spirituage transit a d anyet supplied with it can perform may severally incline measuring job quickly, satify, accurately measures inclines down a he to make faithful and its feet so accurate it can be used instead of expensive sufficient countries. For make for make faithful work in the form of the conting contour for make for the form tables. Contour Plowing Carpentry Brick Laying Comeng Work, Surveying Autoring Foundation Work, Patto Building, Yard Gradies Fencing, Plombing Treatment over installation, Satisfying, Irrigation, Delianous Work, Table Leveling, Flooring, Makey Work, Oralinage Work

CARRYING CASE -- Fitted Heavy Plastic Leather Like Sarrying pub 53 23 ppd.

### VANADIUM! CHROME 29 Pc. DRILL SET



pter th ten ground to the abarperst londer I had not entitle edge of the through hardwoods plant a manufacture of the toughest need for thousands of dri tings but, jobber ten, has been by define from 1/10 \$6.49 see. Also are lable with Turned though the first plants to find all the toughest to 12 Now Also are lable with Turned the transfer of the tought the transfer of the transf

60 Pc, Set Wire Gouge CHROME VANADIUM DRILLS

Tob quality German import high test ( rome Vacad h Prils designed for street drilling through thathough

through the aghest the found to the from and a unit of the from and a unit of the found long on the first of the from the first of the

Send Check or Money Order. II COD, foor outro. MONEY BACK GUARANTEE SCOTT MITCHELL HOUSE, INC. Dept C.S. 418 South Broadway

## You Can Have a

STRENGTHEN your voice this tested scientific way Yes-you may now be able it and its he lawell of your apendang and staging voice. In the process of your room Seef from higher house the seef from red Lin. Chan maked fregulared

FREE BOOKLET

Wrie today for 2 who Frinch right a first back of the track right a Successful to the track right and right and



Profect Voice Institute, 210 S. Clinton St., Studia HR-1, Chicago 6, Ill.



TRAIN NOW FOR A DIESEL FUTURE. Steady, high pay jobs await men qualified in Diesel, Tractor, and Heavy Equipment Are you ready for job and advancement opportunities in this fast growing field? You can qualify!

COMPLETE DIESEL COURSE NOW AVAILABLE. If you are embitious and want to get ahead in this big money field, you'll want to know about the complete Diesel home training course now offered by Interstate Training Service. Covers all phases of operation, repair arriver. Easy to master in spare time. No interference with present to Up to the minute Regularly revised to cover new developments. We invite comparison of materiaoffered. Advisory placement service for our students



CUMMINS-APPROVED DIESEL ENGINE COURSE NOW AVAIL DUNING ABLE TO QUALIFIED MEN.

WRITE FOR FREE INFORMATION TODAY

INTERSTATE TRAINING SERVICE DIOL A	7. Fortland 12. Ore.
Send complete information on aT.5, and	
Common Diesel Courses	

NAME	A0!	
ADDIESS		_
CHY	ZONE STATE	

## INVENTORS

If you believe that you have an invention, you should find out how to protect it. The first step is to have a search made of the prior pertinent U. S. patents. If a report on this search indicates that the invention appears patentable you can apply for a patent, and the specifications and claims should be prepared.

The firm of McMorrow, Berman & Davidson, with offices in Washington, D. C., is qualified to take the necessary steps for you. We can make a preliminary search on your invention, advise you whether we think it can be patented, and prepare your application for patent.

Unless you are fully familiar with the U. S. Patent Laws, we recommend that you engage the services of a Registered Patent Attorney to protect your interests. The patent laws are your laws. A patent gives you the right to prevent others from making, using or selling the invention claimed in your patent for a period of 17 years.

Use these patent laws for your protection. Investigate whether your invention can be patented. If you have what you believe to be an invention, we suggest that you have this firm make a search for you.

Send for a copy of our Patent Booklet entitled "How To Protect Your Invention," containing information about patent protection and patent procedure. Along with this we will also send you an "Invention Record" form, for your use in writing down and sketching details of your invention. We will mail them promptly. No obligation. They are yours for the asking.

### McMORROW, BERMAN & DAVIDSON

Registered Patent Attorneys

PATENTS - COPYRIGHTS - PATENTS
1426 VICTOR BUILDING, WASHINGTON 1, D.C.

## DRAFTSMEN CASH BIG



more success, greater security

### LEARN AT HOME IN SPARE TIME (or at college in Chicago)

Check the want ads in any newspaper—SEE the bigpay opportunities open to you as a draftsman. What's more, you can learn this well paid, prestige profession at home—quickly cashy' No special talent needed' Get complete, step by step Chicago Tech lessons in the mail spend a few pleasant hours studying each week In a short time you'll be a well-trained draftsman, rendy to take your pick of many good jobs. Act now



FREE INFORMATION—MAIL COUPON TODAY!
Got FREE TRIAL LESSON plus information about C T C. practical training Learn what successful Chicago Tech praduates my about high pay and opobligation.

### CHICAGO TECHNICAL COLLEGE

K 227 Tech Bidg., 2000 Se. Michigen Ave. Chicago 10, Historia Mail me FREE Lesson with information about hig osportunities in DRAFTING. 

ENGINEERING

DEGREE IN 27 MONTHS

N adenta gaven operion of state state ong neer og un ter generate i pi gran, sendspu in Buckeler of Brience Deoree in 27 months : or the nanders (our year togram and me to Rochelor of Engineer out It were in at months. The R. R. depree in Mathematics. Chemistry of Physics (Including Nurlear Physics) may be earned in R months, By attending classes year tound, students can graticate in it years and have one ear of experience and income in the one usually necessarie to complete a four year college course Preparatory courses. Thorough, practical program, Individualized instant tog instruction.

Keeping pass with progress in setunes and engineering
Camp Sumer Camp And Sumer Camp 2 cong
student a November Sumer Setules March Jim Super to them
48 states I are no injustices Send compositor free catalog
fully received barrel on a

### INDIANA TECHNICAL

HIDINIA TECHNICAL COLLEGE
689 E. Washington Boulevard, Fort Wayne 2, Indiana
Picase send me tree information on 27 ms. B.S. DEGREES in  Actubes in a Chemical Civil Execution  Mechanical Electronics
on 36 me. B.E. DEGREES in .  Accorpanies. Chemical Civil Mechanical Electrics. (Power or Electrotics) Metallurgical
on 36 mo. B.S. DEGREES in Chemistry Physics
Name

## **MAGIC MAIL PLAN**

### that comes with this Little Machine CAN MAKE YOU \*5™ AN HOUR



Write today for free facts about the newest and most fascingt by of all new home operated bus nesses. For the first time, a simp fied machine brings the fabulous profits of Plastic Scaling and Plastic Laminst ngw the in ceach of the small operator Anyone can learn to operate it with a few minutes practice. Then with our MAGIC MAIL PLAN -can get mail orders pouring in daily with cash in every envelope.

### No Canvassing or Selling

Pill orders at bome in spare time to start. Then expand to ful. time busi-We even supply circulars to bring back cash and orders, Rush name for all the facts you need to start A postcard will do. No charge.

WARNER ELECTRIC CO., Ropt L-3-1 1812 Jarvis, Chicago 26, Illicola

### GENUINE OAK WOOD ANTIQUE TELEPHONES

As it \$9.00 complete. Tested working order \$12.00. Shipments F.O.B Simpson, Pa. Write for free list of telephones.

TELEPHONE ENGINEERING CO. Dopt. SAS Simpson, Pa.



### MASS PRODUCTION MAKES THESE PRICES POSSIBLESS Only world's largest boot

pri maket cav delines inch dialità at Mareni such prices! Write for free color cata- \$99.50 log kits from \$42,00, Freight included. CATALOGI

TAFT MARINE WOODGRAFT Bopt PS-859 436 29th Ave. 98.5. Minnespells 31, Minte

### OUTBOARD MOTOR

### POWERMOWERS, AND ALL SMA 2 & 4-CYCLE GASOLINE ENGINES

MAKE EXTRA MONEY -- or, repair your own aquipment and SAVE! Fully illustrated, easy-to-understand, Home Study Course: Write today for FREE information

### LINCOLN TECHNICAL INSTITUTE 8-G, 472 MARKET STREET, NEWARK 5, N. J.

## ™HYDRAULIC JACK

Earn While You Learn of Home Millians of Jacks in pas & suite service stations, truckers, bady shops, riggers, factories, larms need servicing. We show you HOW easy step by step directions what tools in use EARN UP TO 55 an hour in spare time, by your own basement or garage. Start your own business NUW, Write for folder No. PS 8, & free banus offer

metritute of Medianike time Cera P.O. Box 90, Bloomfield, N. J.

Men, women. Make big profits buying low cost imports abroad (see examples at left) and selling to friends, stores or by mail order Famous world trader guides you—shows you how to find thousands of exotic imports for full or sourc time busi-

ness, how to pecket profits in advance on for-eign drop shipment plan. Full details FREE! Airmail reaches us overnight. Write Today!

MELLINGER CO., 1717 Westwood Dept. X-248, LOS ANGELES 24, GALIFORNIA

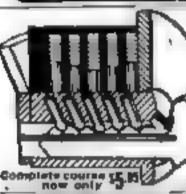
Address.....

## **EARN\$100** WEEK AND UP

### BE AN AUTO-DIESEL **MECHANIC...EARN** WHILE YOU LEARN

Many of our graduates care \$100 a week and up. You learn fast in our school and shops because you learn with tools on real equipment. Experienced instructors expiain WHY and show you HOW, then you DO IT YOURSELF One of the best equipped techmicel schools in the United States. Thirtynine years experience training men Successful graduates in 48 states and many foreign countries. Approved for voterans Day and evening classes. Free buildin-write today

NASHVILLE AUTO-DIESEL COLLEGE 226 7th Ave. N., Dept. 42 Nashville, Tenn.



Locksmithing AND KEY

Now Made Easy! Practical and the course practice you have to pick tooks. Or code make mader keys repair Install service are New self instruction issues for every hundrings hope aways exceptate. mediance service station operator Ba

tt shop, hardware denter gua-smith ID easy lites used les-anna Pai) prire out \$5.55 pest-poid; or C D D, pius postare. Sallefaction or refund guaranteed-

Nelson-Halt Co., Gupt. HR 1 Clinton 81 , Chicago 6, III.

Record breaking travel means nation-wide opportunities and a sound substantial future for trained men in hotels, matels, clubs, apartment house partions faccinating field; fine living; quick advancement. You can qualify at home or through resident classes in Washington. Prey aux experience proved unnecessary Placement Service FREE Write for FREE Book, "Your Golden Opporlunity," Accredited by N.H S.C.

Course Approved for ALL Veteron Training, 43rd Year LEWIS HOTEL TRA MING SCHOOL, Room EM-9712, Wosh, 7, D.C.

### Durchancicas MINIATURE MODELS

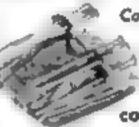
SIST ONTO SIX 106mm Riffen

Library Court

—enly 35€

CATALOG

2464



Cast in metal Scale 1" to 108"

These are the sums official scale, United States and foreign models used in pre-combat and recognition training by our government !

COMET MITAL PRODUCTS CO., INC. Elchmond Hill 18, M.Y.

### FLY YOUR OWN Bensen

### HELICOPTER

Simple to fly - build it yourseif, with engine or as inexpensive gilder type which can be mounted on floats or boat. Order 3-view drawing,

specs and photo of Glider for \$1 or



molor powered Gy et liter Building plans and kits also available-BENSEN AIRCRAFT CORP., Dept. PS-89 P. O. Box 2746, Raleigh, N. C.

## Check the Kind of Body

Slimmer Waist, Hips Broader Chest,

Shoulders More Weight, Solid

■ More Powerful

More Powerful

More Energy, More Restful Sleep

### and I'll Show You How EASILY You Can HAVE It!

JUST tell me, in coupon below, the kind of body you want—and I li give it to you SO FAST your friends will be amazed! I'll show you how you can become a NEW MAN in just 15 minutes a day. In your own home-or it won't cost you a penny!

You wouldn't believe it, but I myself used to be a 97-th weaking, Fellows called me Skinny "Girls made fun of me.

THEN I discovered my marvelous new m iscle-building system—"Dynamic Tension." It turned me into such a specimen of MANHOOD that today I hold the title "THE WORLD'S MOST PERFECTLY DEVEL-OPED MAN" OPED MAN."

'DYNAMIC TENSION"-that's my secret! When you look in the mirror and see a healthy, husky fellow smiling back at you—then you'll realize how fast "Dynamic Tension" GETS RESULTS. That's because it s the natural method you can practice in your own room—JUST 15 MINUTES A DAY while your chest and shoulder muscles begin to swell . . . those arms and legs of yours buige . . and your whole body starts to feel 'alive '—full of zip and go—INSIDE and OUT'

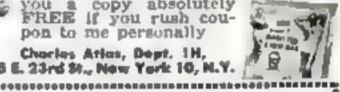


FREE Illustrated 32-Page Book Not \$1.00 - Not 104 - But FREE!

Send NOW for my famous book showing how "Dynamic Tension" can make you a new man, 32 pages, packed with photos, valuable advice, anawers to vital questions. I'll send

You a copy absolutely FREE if you rush coupon to me personally

Charles Atlas, Dept. 1H, aw York 10, N.Y.



CHARLES ATLAS, Dept. 1H, 115 East 23rd St., New York 10, N. Y

Dear Charles Atlas .- Here's the Kind of Body I Wahl:

(theck as many as you lke) Silmmer Walsa Hips Hensder Chest Shoulders More Weight Sol 4

More Powerful Arms
More Powerful Legs
Better Energy

Send me absolutely PREE a copy of your failnois book show the bow thy namer Translan can make me a new man da hages, crammed with photostaphs abswers to with questions, and valuable advice. No obligation.

(Please print or write plainly)

Address.

State City



most on Stereo hish aystems and components. See top buys in band-your-own KNIGHT-KIT'S Hundreds of values in

recorders, amateur gear, P. A. systems, test instruments, TV accessories, electronic parts, tubes and tools. Send for your FREE Allied Supplement packed with bargains and new products. Save as never before!

### ALLIED RADIO

ALLIED RADIO CORP., D 100 N. Western Ave., Chi 5 and fREE Alied Supple	rego BO, III.	SUPPLEMEN	7
Name	<del></del>		_
Address			
Chy	Zone	Stote	



Send today for 100 scarce, beautiful stamps - FREE Get newest issues of last 12 months, including United Arab Republic, Belgian Atomium, Morocco, Zanribar everywhere. So new, some ere not cataloged yet. All isferent, genume, mint and used, bi-colors, pictori topicals. This FREE Worldwide collection has never been offered before. Supply limited, one packet per collector Send for this rare offer today, plus helpful "Collector's: Guide" and other offers for free inspection. Rush name, toe for handling to GARCELON STAMP CO., Dept PStW. Calais, Maine.

GARCELON STAMP CO. Dopl. PSEW, Colois, Maine Bush FREE 100 Different Stomps, Collector's Guide, other offers. Enclosed 10# for bondling. (PLEASE PRINT)

Fires both .33 short a long source. This sensational NFW 6-phot Roses had Purket \*2 revolver to a tremending value at 3 mas its poses blade in W 6-common it is a light he longite exceeding a contact handson. Fires easy to-get Win. Item Western & Let us 22 Long & Start source. Frathers side gain handling tragger adjustment as an in species and fun to about Terrific for larger abouting various birs of at me a hance defente weaking. Only \$12.55 lengther to other 12.5 lengther 1

SEAPORT THADERS, IMC., Dept. PS-8.
Quant Ave. Los Angeles 15. Calif. \$221 S. Grand Ave.



Sid Body Mold course included FREE with Dan Lutie Schetts. On a list Larle Barbetts. On a list Larle Barbetts. On a list Larle Barbetts and Body Maid ' polyters produce such amarking results. To bright as a day easy make you a liston high Next 1 stoy for de la la Course factory price, a list and 1 stoy on 1 stoy of the set 1 stoy of t

PAYS BIG: SEND FOR PREE, BIG. BLUSTRATED CATALOG NOW! Graduated report
one business saickly. Hen women of all ages,
learn really lineares covers daise. Property
Management Appres ng Lagra, Miningages, and
reside to include at the Common search
write TODAY for free book No obligation
Approved for Word War II and Kurean Veterate
Metagement Appres of the DEAL ESTATE (Est. 18)

WEAVER SCHOOL OF REAL ESTATE(1616-1938) 20205 Grand Ave Kansas City, No.

### EARN MORE

turns in your space time during 3 month busy season every year or operate profitable Business Tax Service for year round ncome No experience needed We train you at home Low cost State Approved Course. Write for free prospectus. No

UNION INSTITUTE, LAKEWOOD TOR, NEW JERSEY



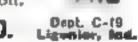
. FULL OR PART TIME . SAMPLE FURNISHED

e Not House-Total ages

m Ton invest Method

· Full ty Part Tent

Sell 10, 20, 100 uniforms at a time. Big reorders. No experience needed. Free powerful sample outfit. Tested selling methods. A few calls can bring you \$50 and more per day. We show you how. Write today. No obligation.



GEORGE MASTER GARMENT CO.



Zone State Check berr if interested Bitt in Besident Training at Les Augeles. VETERANS Give date of discharge

& Electrica Appliance Book

Name Address

My Future in TV Radio Electronics Book "My Future in Auto-Mechanics & Diesel" Book My Future in Air Conditioning, Refrigeration





## SHORTHAND IN

Famous SPEEDWRITING shorthand, 129 words per minute. No symbols no machines uses Alit's. Learn at home or through classroom (nyizaction, Low cost, 500,000 graduates. For husiness and Civil Service. Typing available, 16th Year Schools in over 100 cities. Write for PREE booklet.

Speedwriting



## GET ELECTRONICS

VII training trade to excees as technic and field engineers open a late in countries teather a gainer mass in computers factor and other as the countries of the contract of the second ted to be a sed reducer with matter companies. Start Seed, for the linear countries of the field and the countries of the field of the linear countries of the linear countries

VALPARAISO TECHNICAL INSTITUTE VALPARAISO, INDIANA

## FREE BOOK

Write loday for a FREE copy of illustrated law book. "THE LAW-TRAINED MAN," which shows how to earn the professional Bacheler of Laws (LL. B.) degree through bome study of the famous Blacketons Law Course. All necessary books and lessons provided. Moderate cost convenient monthly lerms. Write for PREE law training book today

Blackstone School of Law, 307 N. Michigan Ave. Founded 1890 Dept. 12C, Chicago 1, Illinois



LTILE HONELET DO.

Send 10 cents for i lustraled folder Dept S-8. Box 9068 Long Beach 10, California



Seputifying buildings by Colorcrete is a business epportunity awaiting men of modest copital everywhere Owners of homes, stores, motels, schools - almost any type of construction-ere fooking for means to give lifetime eye-appeal to drab or d'ity concrete, stucce and similar masonry surfaces. Calarcreters con de such jobs, in little time and at little cost, and pecket generous profile. Colorcrate is a comentitious material, opplied by oir pressure. Taugh, tenacious, enduting. 30 colors. Investigate this lew-investment enterprise by writing for the Opportunity Book.

COLORCRETE INDUSTRIES, INC. 572 Ottawa Ave., Holland, Mich.

Earn \$8,750.00 your First Year Startpart time I employed You abe trained by a nearby dealer and at 5 day training school. Ascarpet-upholstery cleaning apport you provide @ asswices to multiply profits and customer satisfaction. No shop needed Just 2 average lobes day note \$6.50 first year. We help build your ouriness with 27 continuous services counseling. others newspaper at a mate etc. Send for FRF E book etc. DURACLEAN CO. 8-148 Duraction Bldg., DEERFIELD, ILLINOIS



## Want BIG PAY— Your Own Business?

You can usuak y step both a wel told tobe or start a hig profit has been of your own. Shortage of lockers the means apportunities everywhere spate he is ful time. EARN EXTRA MONEY FROM THE START!

A) Special Tools, Supplies Furnished Free the education miner ph a hard are don't minter to the armony steady income trade You care fast at home—re to preside the ever roce brough we'd lowered teacher You do we solve the personal and dance of experie to you have if the had becomed State of S J Accredited that I Home Study Council

For a facing he your own boss or it. It is pay into send for FREE it is rated made Most country at the N 42 country will call Approved for Veterans.

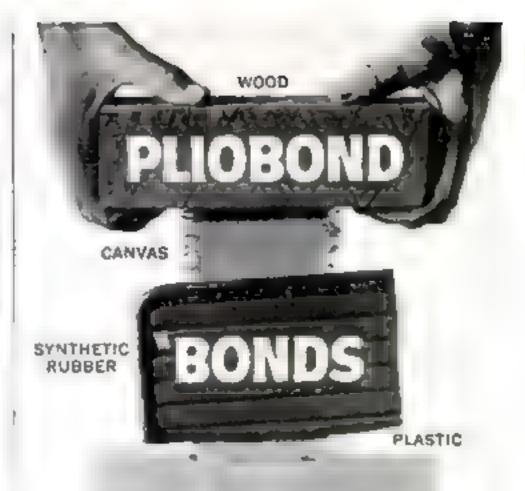
Locksmithing Institute, Deel 208-8
150 Park Ave., E. Rutserford, M. J.



Lucksmith (1651., Dept. 208-9, 150 Park Ave., E. Rutherford, H. J. Please and FREE and without obligation Ultratrajed book.

Name .. .. . Address

City...



GLASS.

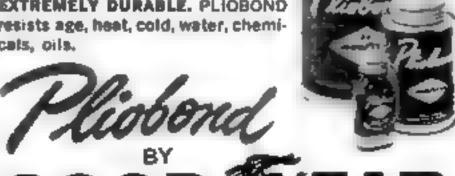
## ANYTHING



EASY TO APPLY, PLIOSOND requires no mixing, brushes on, dries repidly.

EXCELLENT ADHESION, PLICBOND exhibits exceptional strength - up to 1600 lbs./sq. in. in shear tests.

EXTREMELY DURABLE, PLIOBOND resists age, heat, cold, water, chemi-



dyear Tire & Eubber Company, Akron, Dhio

## Get Into One Of Today's TOP OPPORTUNITY FIELDS

Train in the New Shop-Labs of Oldect, Best Equipped School of its Kind in U.S. Pounded 1899

in Chicago - Electrical and Electronic Center Prepare for a better job and a successful future. Train on real equipment no advanced education or previous experience needed. Lifetime employment service to graduates. Part time employment help to students. Finance Plan-enroll now. pay most of tuition later,

PREE BOOK - Mail Coupon or write to address below for Big Free Illustrated Book-"Guide to Careera."

> Information comes by mail. No obligation and NO SALESMAN WILL CALL

COYNE ELECTRICAL SCHOOL

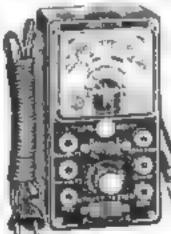
Chartered as an Educational Institution Not for Profit 1501 W. Congress Pkwy., Chicogo 7, Ni., Dept. C9-40

COYNE ELECTRICAL SCHOOL, Dept. C9-4C ISO) W. Congress Pkwy., Chicago 7, III.
Send FREE Book, "Guide to Careers" and details of all training you offer. I am especially interested in
Electricity   Television   Both Fields
Address
CityState
———— (1 understand no salesman will call) ————

Superior's New Model 70 UTILITY TESTER

### FOR REPAIRI ELECTRICAL APPLI MOTORS - AUTOMOBILES - TV TUBES

As an electrical trouble shooter the Model 70:



- Will test fewerers, tram, Bruillers, Heating Pade, Clocks, Fans, Viccours Clouwers, Bafrigargians, Latins, Pharmaconts, Environce, Physiogetists, etc.
- · Will rest off IV tubes for open Blumours, between planted sharts, burned out tubes, one
- Measures A C and D C Voltages, A.C. and B C. Correst, Resistances, Londogo, 101,
- a Mill measure surrout consumption while the appliance under that is to operation.
  - 4 Hearparates a consister direct-reading opsistante range which will assume all rapige. eners commenty used in alastrical applidebted, depters, ply
  - · Louisings districting circuit will fedicule continuity from sore above to 5 surprising 15,000,000 plants.).

As an Automotive Tester the Model 70 will test: 6 Both & Valt and 12 Yelt Storage Setterles 4 Generators 6 Starton 4 Dictributure A fignition Colle D Regulators D Relays A Circuit Brookers

ure & Stop Lights & Condensors & Directional Signal Syste All Lamps and Bulbs it focus in Hearing Systems in Horse it Also will begate poor grounds, breaks in wiring, poor connections, etc.

Model 70 comes complete including 64 page hook, enty

### SHIPPED ON APPROVAL NO MONEY WITH ORDER - NO C.O.D.

they. If non-pleasin assisted then and \$5.65 and pur pathings at rate of \$4,00 per month for it makes Interest or Floriday Charges Added to not nompletely militari, respect to me, re-Cirilonian magney.

MOSS ELECTRONIC, INC.	п.
Dopt, D-667, JB49 Touth Ave. New York 34, NL T.	
Pirate rath Model 7u. (f soliefactory, 2 will pay material specified. Otherwise 2 will relate tester.	
Manue .	
	,
Address	
City State of For H. S. C.	

### realize your dream

Become a graduate engineer. Then promotion will not pass you by. Share rewards awaiting college men . . . higher income, rapid advancement. Important firms interview seniors here regularly Approved for Veterans.

### Graduate Engineer In 27 months

BS, degree in Electrical Engineering (with either Electronics or Power major), also in Mechanical Civil Chemical, Aeronautical Engineering, in 36 Months a B.S. in Business Administration (General Business Accounting, Motor Transport Management majors) For earnest, capable students. Small classes, More professional class hours. Mature students. Wellequipped labs. Modest costs. Year-round operation. Enter Sept Jan., Mar June. Write A. F.

McCarthy, Director Admissions, for Catalog and "Your Career" Book,



## RI-STATE COLU

589 College Ave. . Angolo, Indiana



Eern \$100 Per Week and up AUTO DIESEL MECHANICS

e from this y Day and night

NASHVILLE AUTO-DIESEL COLLEGE

236 7th Street, 16., Dept. 45.

Nucley Up S. Tenn.

## Help Bring Creeks to Justice Through Scientific DETECTION

We have taught thousands this sacition, problable, pleasant profession Let us teach you in your own home. Learn Fig-Secret Service Met as a thursdaylds quickly, at their cost, was and if all a me and livrance identification equity \$.4.2 standards of trades we have been both of telepo.

4 per specific or School Since 1912

SESSITUTE OF APPELED SCIENCE, 1920 Sunmyando Ava., Dapt. 136C, Chronge 40, III.



### SUPER JU JITSU

Now get tough double quick? to the set to the me had be the state of the Port of the had the ten the ten the date. In proper constitute we are not to the state of the state of

### ARTHRITIS?

I have been wonderfully blessed in being abie to return to active life after suffering from head to foot with muscular soreness and pain, Most all Joints seemed affected. According to medical diagnosis, I had Rheumatord Arthritis. Rheumatism and Bursitis For free information

> MRS. LELA S. WIER 2805 Arber Hills Brive—20 P. O. Box 2805, Jackson, Mississippi



### .. Swiss or American

Unique Sweezey Bystem starts you making repairs right away, Dovesops your ok il step by step Toachus simplified modern step by step shop methods professional short cuts. Learn by space time home study from pro-fess and frude school Low terms Free Sample Lesson. No chilest en Write teday!

CHICAGO SCHOOL OF WATCHMAKING 2330 Milwunker, Dept. 489, Chicogo 47, 1d.

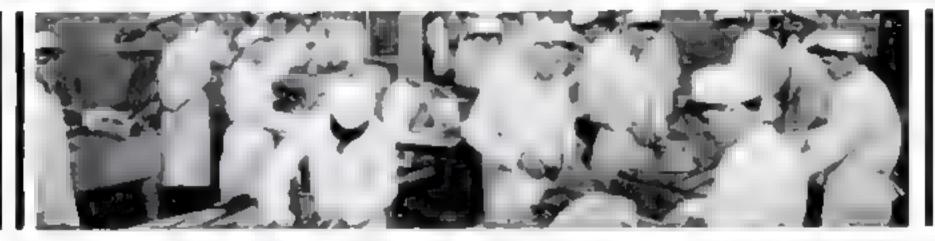




Telescope Lens Kit

Canquer Spece, Explore the Lineram Planula, Moon craters, New Stars, or Campiete Lens hit columns of 30 nech facts leng h ground and not allog objective lens, excepted states for 50 Provided 100 Provided 150 Provided 100 Provided 10 BUSSE SALES CO., Martford, Comm., Dept. PS-78

### N MEAT CUTTING NATIONAL Pay After Graduation



The steady dependable trade of Meat Cutting taught easily in 8 short weeks. YOU LEARN BY DOING under actual meat market conditions in big modern school at Toledo.

For beginners or men with experience. Get a profitable store of your own. Remember PEOPLE MUST EAT! Big pay jobs, Free employment help. Thousands of successful graduates.

Buying, cutting, percentage, pricing, advertising, selling, etc. A complete retail mest education. National School established 36 years. Get National training NOW. Pay your tuition in easy weekly payments after you graduate. Send coupon for FREE school catalog-TODAY, G.L. approved.

ĺ	National School of Most Cutting, Lat. Dept. 51-V. Toledo 4, Ohio
i	Send the just FREE school catalog on National Training at Toledo in Mest Custing Mest Merchandising and Self Service Mests No obligation, No salesman will call
ĺ	Name:,
İ	Address
ĺ	City
Į.	Approved feir Veterma

## INEVALENTACIRASE

TATE recommend that you take the following preliminary steps toward patent protection. Make a disclosure of your invention; sign, date and have your disclosure witnessed by two people who understand your invention; authorize us to conduct a preliminary search among previously granted U.S. patents for similar types of invention. We give you a report on the probable patentability of your invention and our recommendation for further course of action.

Let us send you a copy of our instructive booklet, "Patent Protection for Inventors" and our convenient "Evidence of Invention" disclosure form. No obligation,

O. Martin M. Even

504-J MERLIN BUILDING, WASHINGTON 6, D. C.



## High School



### MANY FINISH IN 2 YEARS

No classes. No time wasted going to and from school. Progress as fast as your time and abilities permit. Standard H. S. texts supplied. Thousands enroll each year in this 62-year-old school. Send for FREE descriptive booklet.

AMERICAN SCHOOL, Dept. HC46 Drexel at 66th St., Chicago 37, IIL Without obligation, places send FREE descriptive booklet. Accredited Member National Home Study Council



- 4 Mam Itarile a LP daggegte
- · Pewer Seets Cpilene finnete
- P. Task squigement. 6 M. Fi competents
- felf at down 173-VAC., 300-W, p



750 PAGE COMPLETE GUIDA **7D ILICTRONIC** PARTS MYING

Profuenty Meanand & ">" A 11" book we h quehavitar es coincles plus in complate his and electrans related (swed in September.

mweelsh Ave. ? Buston, 17, Mass, 83 FIRE Bargard Bulleting for 2 Months Check THEE Record Flyers for 2 Meetles MLQ. ○ 980 Electronic Buying Guide @ 35¢ COD \_\_\_ Silem Watchman (981016) @ \$4.95

PATENT INFORMATION REGISTERED PATENT VENTOR'S RECORD ATTORNEY ABSOCIATE EXAMINER without obligation

N:V/E:N:T:O:

**GUSTAVE MILLER** 88-PS Warner Building WASHINGTON 4, D.C.

U B. PAT, OFF, 1822-1828 Patent Attorney & Advisor U. B. NAVY DEPT. 1830-1847

PATENT LAWYER

## NVENTO

Whether an invention is patentable can be substantially de-termined by a search of the U. S. Patent records. Without obligation, write for information explaining the steps you should take to secure a patent,

JOHN N. RANDOLPH

Registered Petent Attorney

805-Victor Building

Washington 1, D. C.



U. S. Polents protect your inventions. Our free book of "Instructions on Palent Procedure for Inventors," also "Certificate of Invention" form sent without obligation.

> C. A. SNOW & CO. REGISTERED PATENT ATTORNEYS

426 SNOW BUILDING WASHINGTON I. D. C.

### INVENTIONS For Sale

Our clients have excellent inventions in many fields to be make fertured and his ketted of a cash royally or it ense have Full description of a substitute was well by see. I you sail a your it id of interest inventions WE ALSO WANT INVENTIONS OF EVERLY TYPE. Write for deta-

GLOBAL MARKETING SERVICE

2428 77th Ave

Dept. PS

Oakland E. Calif.

SEND FOR FREE "INVENTION RECORD" FORM AND "PATENT INFORMATION EVERY INVENTOR SHOULD HAVE"

WOOLWORTH BLDG., 18th FLOOR, 49C BEW YORK EITY



100X Magalfylos Projector Enlarges Pictures, Printing.

A Objectal — Full Color!

NE IV! Electric Magna-Van Optical bestrament projects & estanges il pplanti, gletures, decebes, objects in full naiural color, correctly & readably Project on wait mereto or labae. MAGN/FIF3
100 ARF AS. Enlarges any material un
to 31-pt in to 32-28 in. For home school.
class. business, short on the door darks
signs, saletches they from any centre
Lipstwice steel 10x2-y-in high Quality
27 focusing cas Operate on sterilari
110 colt exercis. Money back
what interprete Price Farbound
when the Price Farbound
area Streambline Modes. Black plantic case.

Dobuma Streambline Model: Black plantic cast, the height & herror and by Iron. Postpaid \$7.35. JOHNSON SMITH CO., Dept. 794, Detroit 7, Mich.

send 10c for amazing catalog of noverties, live animals, scientific supplies, bothers funmahers, planes & boats, fooms, may't tricks, joke articles unusual teeds gadget in timesavers, cameras, optical goods projectors, movies lucky jewelry, religious naveiries, dequises, musical instruments, stamps come, puzzies fortune is ters rad of, auto & bike accessories telescopes, magnifers, companies, harks, amokers' gadgets, artists supplies or ming sets, engines, motors, shockers, knives, billiotes, frewerks gans, rifes, aports, books, games, plants, etc. Sensi mame, address & 10c tos Betratt 7. Michigun JOHNSON SMITH & CO., Dept. 794

### AS LOW 20C CTRIC MOTOR KIT AS.



Dued by Science Classes, Schools, Model Sulders Speedy, Dynamo-ty is Molor Drives models than up to 6000 ray per min, the created not as provinces, plector-magnetism current fluw etc. A , parts complete ty Chilesest Kany & fun on assemble in a few intemptes. We have a four natural exempte in a few intemptes though About 7 in high 25c each Postpard, 10 or more 25c each 100 or more, 224yc each, 300 or more only 20c each.

JOHNSON SMITH CO., Dept. 794

Detrait 7, Michigan

WORLD'S LOWEST PRICED CALCULATOR! NEW! NEW! NEW!

TOM THUMB ADDING MACHINE With break full Leatherstip rarry ng case, MAOE IN AMERICA BY AMERICANS.
Boware of cheen imported imitst one adds Up to one billion—1 000,000,000 Subtracts—Mult piles—bivides Mintake Prest Pasterely 1995 Accurate—Lightning Fast-Shock Prest Solid Size Mechanism

GUARANTEED FOR YOUR LIFETIME

Ideal for Heiterwayer, Shoppers, Students, Fingle forces and Tan work. Then it to the Super Market where the first overy week. We pay postings if you related their chart or money order-or just selled your name in pulstrass wild say postings in the protein of the sure-in tank Feb. Sar star in interaction money refusion in return mail. Special Gift Offer 2 Machines for only \$2.45 Agents Was at Make casy maps as I mg a Tap Quality Captures at our unless year in my price TOM THUMB ADDING MACHINE POWER.





MONEY

SEND NO FROM YOUR OLD \$1595

NOW LOW AS ... 10 Just rush name and loose plates into new lightweight address for ful free plastic plates, NO IMPRESSION MEEDED Money Back Guarantee THU-GRIP DENTAL LABS., 127 N. Dearborn St. Oent. A. Chicago Z. 111.

### WANT A BETTER JOB? BECOME ELECTRONIC ENGINEER

ONLY 32 MONTHS TO EARN A BACKELOR OF SCIENCE DEGREE IM ELECTRONIC ENGINEERING

Class enrollment similed to allow for individual instruction. Chartered by State of Californ's Nonprofit-non-sectarian coeducational—established Oil years. Either day or even no classes

APPROVED FOR VETS—ENROLL NOW!

PACIFIC STATES UNIVERSITY, Dept. 86 1516 S. Western Ave., Los Angeles 6, Calif.

Please send your FREE CATALOG.

## RCA offers you training at home in

✓ Electronic fundamentals,

√ TV servicing,

✓ Color TV.



Pay-as-you-learn. You need pay for only one study group at a time. Practical work with very first lesson. All text material and equipment is yours to keep. Courses for the beginner and advanced student.

### RCA INSTITUTES

A Service of Radio Corporation of America 350 West Fourth Street, New York 14, N.Y.

In Conado-RCA Victor Company, Ltd. 5001 Cote de Liesse Rd., Montraal 9, Que.

RCA Institutes, Inc., Home Study School 25-89 350 Wast Fourth Street, New York 14, N. Y. Without obligation, send me FREE 64 page CATALOG an Home Study Courses. No salesman with call.
Nome
City Zone State Korean Vetsf Enter discharge date

Resident School in New York City. Catalog on request.



Start TODAY to enjoy an exciting new hobby! Get this big an unble collection of gurgeous, mudti culored triangle shaped brought to you trim strange and mysterapus ands in the wilds of Alrica enchanting Europe, exotic Latin America etc. All granice ail-different-pirturing man-entrog. reptiles, jungle birdt, act on packed sports, ancient chipper thips. PCUS scarce airms s. faburous commemoratives, giant and middet-sized stemps EXTRA! Hargain Cutalog Co. ec. tor's Manual" plus other exciting offers for your inspection Enclose 10e for mailing south Supplies limited. ACT NOW!

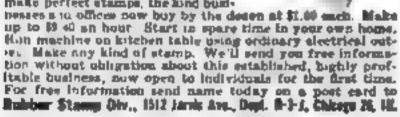
JAMESTOWN STAMP CO Dept. HETPS. MAMESTOWN, N. V. RUSH my Fren "Triangle" Collection und other offers I enclose 10c for mailing costs.

Address City & State

## Ten invention Buts

Home Operators now make \$9.40 AN HOUR in busi-Rena once monopelized by a few big companies

Special cubber stamps bring high prices - cost only pennies to make on new low-cost table top machine, i Take 27 cents worth of material, make perfect stamps, the lond busi-



### Be your own MUSIC teacher



### LEARN AT HOME THIS MONEY SAVING WAY

Simple as A-B-C. Your leasons consist of real selections, instead of thresome exercises. You read real notes — no "numbers" or trick music. Some of our 1,000,000 students are band LEADERS. Everything is in print and pictores, First you are told what to do. Then a picture shows you how Soon you are playing the music you like. Write for big 86 page illustrated Free Book. Mention your favorite instrument, U.S. SCHOOL OF MUSIC, Studie A158, Part Washington, N. Y. Slat year. Tear out as reminder.

TOM & PRODUCESTA SIGNAL STREET

Flok Kraft is the cramest stuff. With this amazing new velvet fiber apray you can turn lamps, radios, cabinets, figurines and 1000 other items into velvely objects of art. You can turn your spare time into real fun and big profital

EARN UP TO \$300.00 PER WEEK SPARE TIME!

You can be crazy like a fox. In 15 minutes time, with 34# worth of Flok Kraft, you can give an ordinary object a gorgeous 3 D finish and charge at least \$20.00?

REPRESENTATIVES IN YOUR AREA DEGENTLY NEEDED

Own your own business. Work at home in your spare time. Help fill the huge growing demand for this unusual velvet-fiber duish. Orders come from stores, offices, homes, decorators, auto dealers - everywhere. Possible million dollar house. Get your share Investigate today be first in your area.' Actual samples in 24 radiant colors. Confidential broklet. "101 Money Moking Ideas" sent feet field no money Coust Industries, Les Angeles 61, Cellf., Dept. A-8

100 POUND SET 12c Pound

140 Pound CHROME DEL This is our feature set and to the finest ever

Computationed.

That ag with adjustable weight in he BEST way to here for the OMLY way to develop event element and a perfect besty As the best est and held equipped surfer I company | BUIL

BEND FOR FREE DATALOG. BUE BARBELL CO.

Lyndhurst 5, New Jersey



INDIGATE & DRAIN & CIRCULATE & SPRAY we the middle or anticot . I life for up to 7 and 63700; and 65700 from 257 well 1 .7 min. Type KB-Sat) hearing death \$12.98

Best for tell drives

Fishpold if each with order

Post drives and for yours indept

MONEY BACK GUARANTEE

Contributes and Gode Pumps in All Slaps LABAWCO PUMPS, Balle Mand 4, N

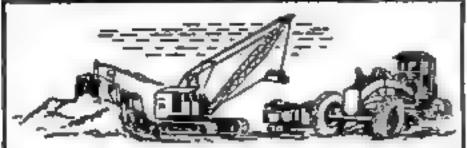
The Gem Maker comes comp sie with all presently equipment including a super charged diamond blade for eawing and all the wheels for grinding, shaping and policiting as complete instructions. The complete equipment as shown, less major and belt for only \$10 to, for, Burlington Wisconsin. Write indian for information and litera-BAI MANUFACTURING CO. Dapt. S. Burlington, Wis



Run your own profitable shoe store manua from base! Represent last growing million dollar firm in spare or full time. We give you — FREE — complete Starting Dutlit that makes you \$217.00 EXTRA each month for just 2 easy arders a day. You feature 195 fast-selling dress, sport, work shoe styles for men and

women. Air-cushion shoes, many other special features! Sizes 21/4-15—widths AAAA to EEEE. Draw on 200 000 pair stock. Also borsehide jackets. Start now selling to friends, folks where you work. Rush postcard for FREE Outfit I

MASON SHOE, Dupt. F-719, CHIPPEWA FALLS. WIS.



Wages can be yours as an Operating Engineer of heavy construction equipment! Learn NOW to operate out diesel engined buildozers, druglines, crones, back hees, acropers been are everytable manufacturers are used manufacturers are used In our fraining program. Contractors are an our advisory staff. Contractors need trained exerciors and pay high wages to our production.

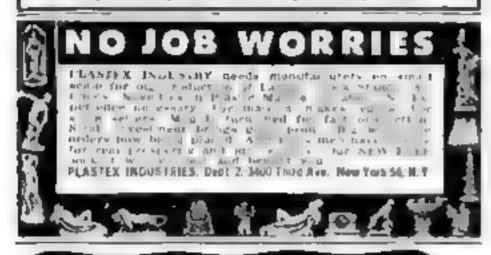
We invite comparison and inspection of the nation's original construction equipment operator's training schools. NEW! Anneuncing resident and non-resident courses in Heavy Construction Management Write for details.

Budget plan available, VETERAMS: Ask about G.I. Benefits

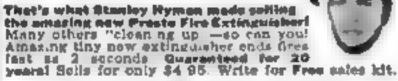
Write TODAY for FREE School Catalog, no abligation, to either address

#### THE NATIONAL SCHOOLS of HEAVY EQUIPMENT OPERATION

Dept. A-22, P.O. Box 8415, Charlette, N.C. Dept. A-22, P.O. Box 510, Weiser, Idaho



## Wauld You ST, OOO A MONTH



Marito Industrias, Inc., Presto Div., 114 E. 32nd St., Dept. P-16C, New York 16. N. Y.

SERVICING RADIATORS!

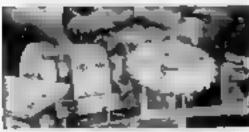
--- Hank Honter, Stowcastle, Wro-



Make good money servicing suic-truck tractor radiators with new intend i Plece Radiator Shop. Easy to test, clean and repair radiators laushed world's largest radiator equipment migr., trains you free. Small down payment starts you Proved merchandising assures volume, Profitable dept. for garage or nervice station Write

(NLAND MFG. CO., Dept. PS-8, 1108 Jackson St., Dozaka Z. Hebr.

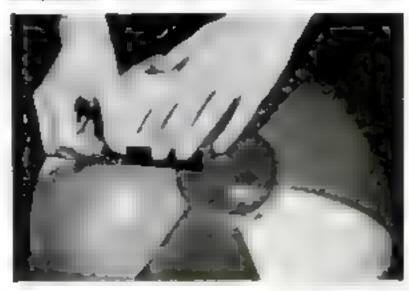
#### Make '5 an Hour CASH PROFIT



THE DAY YOU START! Start your own business at Home... Sharpen Household, Carden and Shop Tooks in Spare Time.

Turn spare time into Big Cash Profits with new Belsaw Sharp-All. No experience needed to sharpen knives, scissors, shears, ice skates, mower blades, hedge trummers, exes, chisels and circular saws . . Learn how easily you can start your own spare time business. Amazing low cost easy-payment plan, Send Postcard for FREE BOOK. BELSAW SHARP-ALL CO. 700 Finis Bidg., Kansan City 11, Ma.

## HOME REPAIR TIP NO. 45



Mand and decorate plastic inflatable toys with "Scotch" Brand Colored Plastic Tape. Stretchy, all-plastic tape sticks like skin, resists scuffing, won't crack or split. Guaranteed waterproof and airtight! Get it in white, red, yellow, green, brown, blue, black or new clear plastic that blends with any color! In 3/4" width-29f, 11/5" width-59¢ at stores everywhere.

Don't run short . . . NEXT TIME BUY TWO!

Mode by Minnesota Mining & Mfg. Co. St. Paul 6, Minn, @3M Co., 1959



## ENGINEERING



Photo of Heald Students in Electrical Laboratory

**Enroll New for New Yorm** 

Heald College Ranks FIRST Wast of the Mississippi in "Who's Who in America"

Heald Engineering College

Send for FREE Information

Bel. 2869 Van Ness at Post, Dopt, PS-859 Sun Francisco, California Hoold Trained Engineers are Moving Ahead and Winning High Positions Throughout American Business and Industry.

## BACHELOR OF SCIENCE DEGREE, 27 MONTHS

Degree Courses:

ם	Electronic Engineering
⊐	Electrical Engineering
_	Highway Engineering
J	Mechanical Engineering
╗	Structural Engineering
٦	Civil Engineering
	Architecture

Diplome Courses:

TELEVISION () Calor TV
E ectronic Technician
Industrial Electrosic
Tech.
Tool & Die Dasign
Architectural Drofting
Mechanical Drafting

Approved for Veterant

Structural Drofting

NAME	 
-	
CITY	 
STATE	

# MORE-LEA

OR TRAIN WITH OTHER GREER DIPLOMA COURSES

AUTO MEGIANICS

DIESEL MECHANICS

OAS-ARC WELDING

☐ REFRIGERATION DIESEL MECHANICS AIR CONDITIONING MACHINIST TRACE ADVANCED MACHINIST

Skilled men are needed in every part of the country. Earn top pay in established shops or start your own business. Greer's expert instruction and actual shop training teaches you how You learn by doing—quick. easy courses using the latest tools and equipment. Day, evening and part time instructions available.

Job placement and convenient living accommodations are yours while training Contact GREER S PREE JOB PLACEMENT SERVICE when you entoil if you wish part time or full time employment.

ENGINEERING DEGREE COURSES

OFESEL AUTOMOTIVE ENGINEERING 27 MINISTRIS

REFRIGERATION & AIR COND. ENGINEERING 18 MONTHS WELDING ENGINEERING 18 MONTHS

All Courses Approved 🗀 City, or 🗀 Q. J.

Plague ruth me froe literature on the trade indicated et no obligation.

NAME

AGE.

STREET\_ TOWN

ZONE\_BTATE

Established 1902

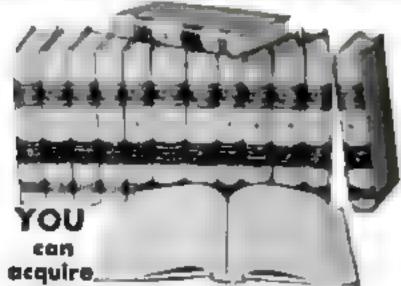
BOX H, 2238 S. MICHIGAN AVE. STREETS Chicago 16, Illinois Francestre

## TELL HOW TO PREPARE FOR Electronics

Train in Bellry Took's Chicago or Toronta toboratories for good jobs or your own husiness to Madio-TV-Electronics. Or, in spare time at home, get visual and films, taxts and elec-tronic parts. EMPLOYMENT SERVICE. Usualty more jobs then graduates. Write Dept. PS 4-P

, 4141 Belmont Avenus Chikaya Si, Illinois

IN CANADA: 626 Resolaurs Ave., Toronto 12, Ont.



#### AT HOME! EARN LL.B. DEGREE

Logally trained men win higher positions and bigger success in busi-ness and public life. Orintar opportunities new than ever before, We quide you step by step, You train in spare time. Degree of LL | We furnish all text material, including valuable 14 values Lew L. beary Low cost, may terms. Get full details. Law Ymining in Leadership" and "Evidence" hooks FRICE. Bead NOW

Accredited Member, National Home Study Council. LABALLE EXTENSION UNIVERSITY, 417 South Peachers Street A Correspondence Institution Sopt. 8831. Chicago S. H.

## MAKE EXTRA CASH

SHARPENING LAWN MOWERS THE MODERN WAY



Start your ewn shop! Full or spare time. Earn many dolars en a short time . . . average \$5.00 per hour, Many mowers need sharpening With MODERN'S Extra Heavy Duty LAWN MOWER SHARPENER AND BED KNIFE GRINDER YOU have 6 mach nes in one. All aperations are done quickly and easily You make money from the start, Write for free details.

MODERN MFG, CO. 160 N. Fair Oaks Ave. Dept.

Pasadena, Galifornia 114

## STUDY TO BE A DOCTOR of Psychology or Metaphysics

Obtain a Ps.D., Ms D., or Ph D. Be a Teacher, Lecturer or Accredited Practitioner, Teach others how to achieve Health, Happiness and Contentment Chartered by State Correspondence courses unit. Write for FREE book telling how.

#### THE NEOTARIAN FELLOWSHIP

Dert 6 Pleineick Bulld net

Kapeas City 6, Missouri

have you can learn how to make hig motory by coat og thousands of perfect publishes, book gods figu nes etc with X L rubber mouds. to the men ate with X L. rubber made.

IN CIPATHEE FIRE AT LITTLE CAPITAL REFORM

X L. Robber Fire & 10; Ohn 14 00; postber ex and Morde and research rubber

for here moids 11 50 prepaid U st. only.

Send Sic refunded with orders for informaderful est og Profit mat og mentelet

PROFITS

## STUDIO MUNETE, INDIANA

Home-Study Course-Only \$5.95 Teaches you commercial sign pointing and older building as it is being done TODAY in leading shope all over the country Complete practical restees for self na mark on. There offers would lettern, redecing stems plans through algoe good leaf with screen process, delice does a phately product belongs before information electric between the market building and the last self-battle action of a high price! correspondence can be full rice only \$1.5 postpaid Dr c O D plus postage No risk market today Satisfaction of money back! Order 'Sign Painting Corres"



MELSON HALL CO., 210 5 Clinton St., Oant 2HR 1, Chicago &, Ill.



## SPECIALS - 80¢



These GIANT & POOTENE can be yours while they took at a fracheoprens fort, surplus. Great for advertising, you paint your meacrowds to sales, displays, open-ings, Mores was stations Pun at home for young & old and just the thing for any party or school prim-Perfect for beach or pichic. They re BIG, they re FUN they're itseful so order yours today!

13' din.-\$1.95 pa.

Postage pd. on ppd orders, Cal. res. add sales tax. ared 304 for latest catalog-refundable on order of \$2. or more.

FRANK SALES, Bapt. PSBS9, 3930 Sunset Blvd., Les Angeles 29, Calif.



Classified Ada only \$1.10 per word insertion, payable in advance. Minimum od 10 words. To be included in Detaber issue, capy should be in our office by August 20. He concelletions accepted after August 16. Address orders to O. K. Kelly, Classified Adv. Mgr.

#### AUTOMOBILES & MIDGET CARS

CROSLEY or Foreign car parts catalogue Parts discount club Sox 7, Etmont, New York

HUNDREDS of automobile catalogs -American, antique foreign dealer boots, giousy photographs, shop manuals free motor magazines disred by non profit organization. Write immediately get on free mailing list. Auto Maniacs, Stockbridge, Michigan.

1938 CATALOG on Parts Kits for Golf Burry or Jr. Sports Car 25c, Indus Corporation, 1818 Madaon, Indianapolis.

FREE Bookiet! The Advantages of Front Engine Cars over Rear Engine Cars Learn the truth behind the newest engineering controvers. How rear most ted engines pose a definite threat to driving stability For your free copy, drop a card to Simca Bases Office. Christer Corporation. P.O. Box 1919 Detroit 31 Managem.

NEW Catalog Model cars and kitsminiatures to gas powered Biggest selection in USA send 15c Auto World Ent., Box 206, Scranton Pa

## AUTO NUPPLIES A

SAVE money on Jeep and army truck parts Large inventory Catalogs for Jeep and Q M C owners American Auto Parts Co 1839-PS Locust, Kansas City, Masouri

Olant Auto Parts Catalog Thousands Special Accessories Stores Don't Handle Oadgets Custom Equipment Send 25c (Refundable) Newhouse Automotive Industries, 5505-PS-S Beverly, Los Angeiss 23, California.

RING-Valve job while driving \$6.00 Eighth successful year, Free details, Motaley Grantham 27 Penna.

AUTO shop welding repair training in world a largest non profit school flow tuition Pree booklet Hohart Welders. But P-801. Truy, Ohio

MEN! Motor Pouled Burn Oil. Valves Click? Save Dollars With "Trucker's Secret" Guarantees Better Performance. \$2.00 Postpard Random, 213D Newcastie. Syractuse 4, New York.

1909-1914 FORD parts. Hustrated catalogue 50c Mark Auto, Box 8B. Layton-New Jersey

1950 EDITION It a New! It a different!
Oct world a largest auto accessories and parts catalog save up to 30 136 pages over 100 000 items for 1930 to 1930 modes including Hollywood accessories, sustain styling and Hi-Speed Equipment. All parts and accessories for all cars and trucks. We have that hard to get part Jam packed with bargains Completely Hustrated. Send 25c (refundable) J. C. Whitney. 1919 PS-9 Archee, Chicago 10. Ill.

POREIGN Size Tires—Brand pew gouranteed, at big savings Write Washington Tire & Robber Co., 3141-PS Washington Blvd Baltimory 10 Marvisad.

Blvd Baltunore 10 Marviand

BTEERING Wheels—Midgets, etc \$3.25

up. Literature 10c Steerite Products.

Dept. PSS, Box 221. Long Branch, W. J. Western Merchandise

## TO FIND WHAT YOU WANT

Advertising, Appendes for Advertisers. Agents Wanted Air Cond torong Antique Re on & Indian Conds. Ant our Re call An a Numbers AA Sig Au hara Service Anti No. 74 & Equipment Aut Tra ers Avtacron Batteries Generators | 100 He was the same Dutt mid Market digit in the Hus first Ot order to a Buy it Whotenale BRA P Cameraa Photo Supples
Cameraa Photo Supples
Cameraa Photo Supples
A To
an oning Sun Pentil e 15 h lahC Photo Fin shing nd. 16 24 45 4 pollegs 47 Detect year In it to roulf Done it ber-Educational & Institute of French St. (en & Franch St. (e 45 64 N 110 Form Machinery
Farms Other Heal 2 is
Fired Classes Telescopes
For Inventors
For Rale Miscellaneous 104 For Ra e W see For he Home Firms' to 1 as Fing Raising 184 77 Geiger Counters Treasure Finder Help Wanted

If higher halesmen

If they milectons

Hime Craffsman

Hymothem 42 Inventions Wented 91 248 . John Games Kervilles Fir. Language Outlin 10 Machinery Tool Supplies Fire Mac of John Publics for Starofactu of Processor Senses We answer Supplies
Morte's Model Supplies
We smak & Object of sea
Morte Servers A Sea to and I object
Morte Servers A Sea to and I object
Morte Servers A Sec. 35 44.6 31 Of Interest To Women the total dewely Watche-21 Patent Attorners Patenta For Sale Per noul Photo Finishing Photocouses Fig. Part of Pharmacouses Fig. 412 5 400 Pour ry & Supplies for our Ma Strath on the principle Outs a Nu ex Profitable Desupotions 23 Radio, TV, Supplies & Equisment Rator Stades, Shareto Rubber Stamps & Office Supplies , 34 Science & Chemistry
Special Services
Sporting Goods Gune Fishing Turkle.
Etc. 41 Stamp Collecting 79h Swap . 75 13 Tattooing Appolies Tax lernig Tot arco & Piper Trees Shrubs Boots & Herbe Tr genometers Typewriters & Office Machines . 20 33

PAT ic on the do lar or less on Government Surplus Jeeps, a rosanes boats, thousands of asetus items Bus direct from U.S. Covernment Ansone can May \$1.00 for 1858 directory of depots and how to bur Western Metal, Dept 107 Box 854, Dallas 21 Texas

PUEL Injection Complete plans & Parts price list \$1.00. 6-8 & V8 included. Accumeter Box 572, Columbus 16. Ohio

RING Valve Job while driving \$1.00 delivered. World a only the enterly product of its kind. Lackage is a Money lit back guarance. Pres of Jormanion. Jos. Disch National Distributor, Box 327,6, 37. Bridgeport. O) to

#### AUTO TRAILERS

BUILD Expanding eight foot trailer Accommodates five Late after the Fra-Mar Company Wilmins in Massachusetts.

ALUMINUM Pickup Coach Esta Trailer blueprints. Laterature 10c. Come ock Trailers Parsons, Kansas

#### MOTORCYCLES, MICYCLES AND SUPPLIES

CUSHMAN incorreceiter \$15. Micro-midget \$25, here empines. Boys midget tacer \$25 de Cart \$55 Harse muto tycle \$56. (Malforder only) Send 25c (\$56 for first class mailing) for \$2-page Directory-Catalogue Number \$6, listing these and hundreds of similar bargeins, homebuilders parts, plant, etc. Midget Motors Directory. Athens. Ohio.

MOTORSCOOTER 46 00. Delian Motorcrite \$30 00 Why er \$ 50 Briggs (Kick Starter) \$12.75 Send 25c (No first class may for ca stop = 33 aimmed with seqsational bergains in the re-metorscoolers, midget cars, motorbikes, construction plana. Gall, 1311 Jefferson, Toledo, Ohio.

MSU accoters and motorescies. BMW motorescies 2 to 15 HP enalidring and chandring Butler & Smith POB. 45. New York 24

RECONDITIONED Motorevele Motors. Chrome acressories Conglete stork Indian parts Expert rebuilding Past service it dian Motorcycle Bairs, Kanass City 27, Missouri

1000 MOTORCYCLE Barga na Parta-Equipment Repossessed Autum blies Catalog 35c. Bunsco, 146-PS, Covington, Virgrafa.

#### AVIATION

HOMEBUILT Helicopter Handbook \$1.00 Homebuilt Helicopter Directory \$1.00 Urshan, But \$232 N.F. Station, San Diego 4, California.

CAPTIVE He leopter uses chain saw engine Complete plans illustrated instructions \$3.00 Flight Dynamics, Box 5443, Raeigh N C

PROPELLERS plans, supplies for sixboats and anowals less La'est designs, prompt delivery Catalog 25c Banks-Maxwell, Box 12610. Pt. Worth 5, Texas, DUCTED Inn. design Used in V.T.O.L.

DUCTED ian design Used in V T O L. aircraft and flying platforms Specifications and five pages of drawings \$2.00. Tyna-Turbine, Box 11353, Phoenix, Arisona.

SA.

#### ANTRONAUTICS

ORAVITY intest undisclosed theories and information \$1.00 G and P Research Lab., Box 674, Bristol, Tennessee

#### ELECTRICAL SUPPLIES & EQUIPMENT

BOOK 300 Electric Stants \$1.00. Cut-tangeon, 20378 Argetraders, Los Alton, Cal-LI ON THE

REPLACEMENT Parts all rect firm. DC Power Buppares Bu dest-vourse f kate for my apparations Electrical Distance, 1824 E East First, Los Angeles 23, Callformat

LAMP parts. Wholesale. Thousands of Items for repairing, converting. Catalog . 25c. Brown Lamp. Box 305-D, Clayton 5,

ELECTRICIANS! Bend conduit entity, correctly Latest "Simplified Bystem" to be them Outorth, Bux 455A, Clarks-

APPLIANCE Paris Accessories Whole-asis. New Enlarged Catalogue 25c Seco. 26 South 20 Street, Birmingham 2, Ala-DAME &

PREE catable fan and motor supplies Modern, Bus \$115 Eannas City 14. Mo

#### WELDING, SOLDERING

WELDERS, 119-230 Welds 1, \$19.50 Morris, 1976 Inner Drive Schenectads. New York

MAKE Difficult Welding John Rasyhow Bend 25c in coin to Arcair Co., Box 451 Laurantes Otio

ACETYLENE Welding Outhis new 656 50; Arcwelders \$55.50, Eagle Welding. Dept. 42, 5085 Broadway, Chicago 40, Ill.

#### MACHINERY, TOOL SI PPLIES, ETC

TOOL Catalog, Maltion dollar inventory, soc Ocurge Demon Calliornia Marsiand

NEW dearn machinist tools Write Campbell Tools Co., 1424 Barcley, Spring-Brat Ohio

#### TRIGONOMETERS

ENGINFERS Draftamen. Brudente Triangulator Makes Trigonometry Fasy \$1.25. No C O.D. Trical, Non 47, Buffalo 15, New York.

#### ENGINES, MOTORS, ETC.

DIRSEL Injector Parts and Puet Pumps Wanted OMSI-II-118, Mayer, 7129 Car-

BRWIND Motors Yourself Complete Instructions. \$1.00. Lewis Mig., Howell 11. Mich gen

#### **FARM MACHINERY**

SENSATIONAL Garden Tractor Hoes believen plants and rows, anchiding strawberries, Eliminates hand beeing. Standard th size, yet untirely different. Patent 1742440. Also tills. Pentastic offer to first few 'nautries. Auto Hos, DePere 69, Wis-

#### II BOATS, OUTBOARD MOTORS

NEW used, rebuilt marine motors Marine convergeta, hittings Free Blokes Marine Bupp., Dept. 23. Contwater, blich

SAVE! Save' Savel World's Finest Boat Write for free color catalog. Dept. PSM-838 Tafs Marine Woodcraft, 636 39th Ave , M E., Minneapolis, Minnesota

KIT Boats in me ded Fibers as of premakembled po word 50 Gun as teer mid-a. 14 .5 up fregit paid car terms Five rathing for ones hardware fibercians stip-pies trajers Luger Boats Dept E.-S. Minneapous 20 Ministeria

BOAT Plans-Pull Size Patterns-Frame Kits. Modern Inboards and Outboards for I amateur builders, Complete New Catalog 50c or specify requirements, Glen Marine, \$152 Rosecrans, Bellflower, Calif

ford, Akron 14, Ohio.

FULL size cut-to-shape boat patterns, bitterints T', 36 feet Big fire \$6 pg il-histrated Build's Boat Cutalog of Naval architect designed Cruiners Runabouts, architect designed Cruisers Runabouts, At its Outboard Boats, Sailing Raring Houseboats 50c How to Build a Boat? Sootlet \$2.50 Hardware & Equipment Cataing \$3.00 Circuland Sout Buryunt Co. Dept. A-71, Box 1661, Circuland. Obla.

PIBERCILAS Book Covering wholesale prices Free Literature and samples fietlert a, Box It X DePere Wiscousin

#### IN MODE BUILDING COURSES. JIL JITSU & ATHLETIC FUI IPMENT

BUILD powerful arms, chest shoulders' 22 exercises \$1 Ponsed, Box 801-C 1100 Market Wilmington 80 Delaware

TOURS-a body like a Greek God' Starting amazingly Quick New method ex-panced in free literature field name and address to DeVe.-O-Plan 2007 W Mag- ; holis Bird Burbenk, California.

BARBELLE, Dutubbella, Courses Apparatus, Booklet 10c Cloud Burbell Co., Silvam Springs, Arkanyas.

PREE Muscle building information extreme Box 686A. Worth Minint 2004 \$16A. Bouts : one Piorida.

PUSHED around? Don't take nonsense from builtes. Surprise them. Easy when you know Police Jiu Jitsu. Complete fully illustrated course in one volume as taught po not and armed forces. Send \$1 now. Sette-faction guarante-d Books Publishing Co Amityville 20. New York.

#### FIELD GLASSES, TELESCOPES

DYNASCOPE omaring world famous re-Bector telescope Request five bruchure Criterion Dept D6 63 Hartford Coun

FREE Catalogue Thousands was surplus optical barga na Lenses Prisms. Telescopes Binoculars etc Bend \$1.00 for 18 Lette Hobbrust Net and Preject booklet Il Jacques 401 West Merrick Hoad Lyn-bronk New York.

SINOCULARS, Telescopes, Microscopes Terrific values \$3.36 up. Request free money saving calalog, Criterion, Dept. 5 h Martford Cona

WAR Surplus bargains Millions of lenses instruments to escapes binoculars, components and complete due of as re-porting telescope flems. World's greatest optical market place. Send a y \$1.00 for beginners to less & L and big instruction binkles Block 2 CN. Write for catalog CN. Proof Edmutel Scientific Co. Barrington. New Jerier

TELESCOPES Sinctulary - all sizes Complete opins parts accessories for tele scopes Pres catalog Suffolk Science Mattilla: k New York

REFLECTING Telescope completely assembled SoX Guaranteed Observatory clearness. Proc information. The Sk prope Co. P. O. Box 55 Brook in 28 New York

STAR—Atlases, astronomical books, free det. Hezheri Luft. 40-11 200th St. Flushing \$4, 36

BUILD your own Reflector Telescopes, complete kits: Mirrors Evepleces Tripeds, all other accessories. Request free litustrated their one Criterion Manufacturing Dept KP-36 Haz ford Conn.

AMAZING prices, precision hinora are ider Binocular Selecting catalogs free Dealers also write Prentiss Import-Mercury Bidg., West Los Angeles 25.

REFLECTOR Telescope E.ts direct from factory From \$7.75 Other optical de-it-yourself kits. Pres bookset. Esco Products. Oakridge, New Jersey

TELESCOPES-refractor, reflector, kits and accessories. Pree illustrated broklet Dell Optics Co., Lamited, Dept. PS, 328-55th Street, West New York, New Jersey

COLLAPSIBLE binoculars 1x25, cave fits pocket \$2.00 pad Hubbard, 1641 | Lyola Benton Harbor, Michigan

#### ROPE Hylon or polyethylene wholesale 15 SPORTING GOODS, GUNS, prices. Wolls Specialties Inc., 156 Stan- FISHING TACKLE, ARCHER FISHING TACKLE, ARCHERY, TRAPPING

100 006 PRODUCTS Wholesale - Free catalog Bend postcard Scott-O-Mart. Whippany 16 New Jarsey

Wholesale Catalog Beads. Spinners Lura parts S aker moids. Juga Reels Pinnysports. (PE) Toledo 6. Ohio.

CROSSBOWS! Hunting-Bows! Pactory Prices! Jayon, Box 1355, Wichita, Eansas

6-SHOT Colt Revolver 22 Cal. Short Ammunition. No blank \$12.50, P.O.B. Chicago Import Associates, Dep't. PSt. 185 N. Wabash, Chicago 1, Ill.

\$ 000 BARGAINS, firearms, binoculars, was realty catego 50t. Smith Museum, Runnemede, N J

WEW Thereworm, nature's tough, lively worm catenes fish, I packages \$1.00 ppd Free fishing secrets in each suckage Cash in advance T grown Forsth 5, Montana Besterebip open.

GOLPERS' Beat Brauging Buddies Bub-at to c Of Center Golf Bail It 6 ices. It said Wobbles Like Crear On Green Fac 3 For L. 20. Wilson 6, 25 Ond Balis. I For 32 35 H. artom Bus ness Cards Each Order 250 Postage Hall 212H Heweastle.

10 000 GUNS" Swords - Kentuckies-Colta Lugera Hunting Ouns Bargain Catalog de Agramonte s, Yorkers 2 A

MOLDS for Picherman a Sinkern Jiga. Squids, Casting and Spinning Lures, Free Catalogue, Sweet's Moids, Tonawands, J.

POOL-OOLP build intriguing new in-door-outdoor game. Plans \$2.00. Crawford Amusementa, Inc., Lebanon, Ohio

JAP rifles altering American shells 36 00. Jap shells \$3 65, catalog 10c, TP Shop, West Branch 10, Michigan,

PROVEN Sait. Freshwater Lare \$1.00 Crown. 78 Olenridge Ave , Montclair N J

PISHERMAN From 3 Dista Lures 25c Coin For Mailing Dixes Lares, 1200A Oregory, Greensboro, N C.

## CAMPING EQUIPMENT

CAMPINO Equipment, would a largest selection for prices Send 25c (print hame address) for 140 page com-ere cataccess of Tenta Camping Equipment ha-tional camp sites the de & Cam, he Hand-book Metsah 10-15tr 30th Avenue, Long Is and City I New York

## 17 DOGS RIRDS, HAMSTERS, RABBITS & PETS

RAISE rabbits on \$500 month plan Plenty markets. Proc details. White a White & Rabbitry Delaware, Ohio

PLYING Squirrels. Beautiful pets. Lit. erature, prices and pictures 10c. Greesons 205 North Monroe St., Arlington, Virginia

#### LIVE BAIT

PREE Laterature-Big money raising dishworms and crickets. We teach you how to take a d sen Breeler redwormsmarketing Instructions, 5000—\$17.50 Medium size—10.000—\$19.85. Carter Farm-12 Pair his Courter at

AFRICAN Giant Estimorms 100-\$2.00, 500-07.00 Dealers Quoted Ozark Worm Farm \ W now Spr gs. Mesourt

#### FARMS, OTHER REAL ESTATE.

LAKEFRONT, Highway, Acreage and The er are from \$200,00 Filest central Florida developments. Monthly terms. Box 2005. DeLand, Florida.

FLORIDA-Nice homesites, \$365 at \$10 monthly Folder Free. Winfree Vernor, DeLand. Florida.

CANADIAN Exclusive Vacation-Sporting t ub Cirante Members Free Cottage S. tes Useage Ad Pa ... es Annua Membeing \$ 0.00 Throughout Canada Ex-cellent Vaca on Playing Hunting Areas Pres Informs on Vacation Areas 1828 Acton Donnaview Ontario Canada

NEW Strout Pall Catalog Just Out! 148
Pages. 36 States. Coast-to-Coast Forms
Homes, Businesses. World's Largest 59
Years Service Strout Healty, 251-ZB 4th
Ave. New York 16, N. Y.

#### 22 PROFITABLE OCCUPATIONS

EARN Money At Home raising fishworms for us! Backyard, garage, basement, We buy your crop! inquire. Oakhaven-1, Cedar H.il. Texas.

RAVE Money! Buy Wholessis! Pres Cutalog General Merchandise. Norris, 487-H Broadway New York.

\$5000 FROM Half Acre growing Oinseng, erop bought. Particulars 10c. Associated Growers, Sperling, Manitoba.

WATCH Repair Course, 70 Illustrations. Quaranteed \$1.00 Web Service, 1890 Sq. Hooker, Denver 19, Contrado.

VENDING Machines—No Selling Operate A Route of Coin Machines and Lazz Amering Profits 27 Page Catalog Free Parkway Machine Corporation, Dept. 17, 715 Ensor Street, Baltimore 2, Maryland

TREE-mushroom pioneers! Spawn Instructions \$, 50. Otiga, PB-150, Supekenhusett, Japan

INVESTIGATE Accidents—Earn \$125 week to start Claim it was against and urgently needed to investigate more than 490 000 accidents daily Work full time for insurance company rangued attaching time or government office Or step title year own profitable one time bosiness No experience needed Free book, more Universal Schools. B-8, Box \$202 Daisas 5, Texas

PECOME independent with your own franchise business. Thomsands parasing handsome incurren Requist interesting facts today, National Pranchise Reports. PS-526, 333 North Michigan, Chicago 1.

PREE Laterature - Make Big Money Raising Fishworms and Crickets. Carter Parm-10, Piains, Ga.

PROPIT from large selection of franchises available your territory Free information ruched Franchise Previews 25-D 12.8 Standard Suisding, Cleveland 13.

OPERATE amazing new mail order plant Proc Details, Ivan Robinson, 1414 R dies Ave Santa Rosa, California

#### 23 BOOKS & MAGAZINES

GOOD Used Books, Sec-\$1, Free Lints. Editions. Dept. Po. Hempstead, New York

BRITISH Book Bargains, Any subject Catalog free Transbooks, Box 1-PT, Wan ash, N Y

BOOKKUNTERS All Subjects, Send Wants Jaher Book Service 183 Hazelwood Drive, Westbury New York

SCIENCE Fiction Book Bargains, List Free, Werewolf Bookshop, Verona 1, Pennayivania

ATHEIST Books Cataionin free Truth Seeker Co 36 Park Row, New York 5

DISPOSALS. Un'll Sold Out S Books \$1.00 B g Mad Amazing Samples-300 Prest, 436 B Y Ave., Broadlyn 23. Hew York

COMICS Magazines wholesale Pr all Ca mogue 10c Backon es list East Lotabard Ba tumore 2 Maryland

1 000 000 BOOKS- 10r early Every subfect under the sun' 2 rainlogs-120 pages -dime Modern Ma. Ray, Box 124-PSS, Stuyresant Station, New York City 2.

SCOKSKARCHERS Bend wants Ansaubject Vanguard Bookseliers, 4480-8 Hollywood Blvd., Hollywood 22, Calif

BOOKS old and new on all subjects. Pres catalog Naboma, Box 20125, Los Angetes 5, Ca Horrisa

#### 24 HIFNOTISM

HYPNOTIZE Self Others while asleep with amazing hypnotic phonograph records, tapes. Catalog free Research Association Box M.O. Olympia, Washington.

PREE Blustrated Hypnottem Selfhapbosis Catalogue Write, Happortist STRL Sunset, Hollywood 44P, Canfornia

PREE Catalog' Hypnotism. Autoby mosis Books, Tapes, Records! Draws.: PS607, Buidoso, New Mexico. ERAY Mind! Eypnotize, one glanca. Custanteed \$1.00 Wannitcher, Box 10. Otters Cape. South Airca

WMIRI ING Hypto-Coin hyptotim others at minutes with this inscine ing plastic divention. Comparie with retearing secrets its tractions. Only 10c. Makes back if not delighted. Hypnotic Aids Ph-6, 1113 Broadway, New York City 10

HYPROTIZE, One word, one glance, complete course only \$1.00. Satisfaction guaranteed. Quality Book Co 345 East Broad. Athens, On.

HYPNOTIZE Successfully! Learn Easy, Fast Modern Met note Complete Unistra ed Complete Distrated the International and "Secret Kerve Pressure Technique Guaranteed Harmiers)—\$1 00. H. Powler, 608 N. Broad, Woodbury New Jersey

HYPNODISK 50c 25 Lessons Hypnolism Book 50c Box 13s2-H Philadel-

HYPNOTIZE One word One fingershap, on stage Satisfaction—or relune \$1 Hypnomaster \$44-55 Sunny-sate Chicago 40

HYPROTISM Autoaugust on Home-Bild Course Guarantees attachy resuma Dr. home maned School of Applied H gmilest Dept B. 200 W 57th \$4, New York 10 N Y

SCIENTIFIC Hypnosis" . Powerful Method' Complete Instructions. \$2.50. Box 292. Arlington Heights, Illinois.

X-RAY Glance." Entire course. Adults \$2 Hypnomaster Box \$300-XH, Chicago 20

JOIN Hypnotists' Association, Earn diplomat degrees Parchings Philosophy Scrike Aused Central Valey New York

#### HA JOKEN, LAMES NOVELTIES, ETC

3100 MOVELTES Jokes tricks undgets. formakers hobbles hig carsing 16c. Journals Smith D 487 Detroit 7

#### MAGIC TRICKS, PUZZLES, ETC.

Part Cleat Magic Catagor and Assonishing Trick both for cut 25c (8) 50 Valuet, House of 1005 Masteries, 202-P.O. Puterwood, Transbull, Conn.

WORLD'S Short professional magic John povelties. Giant Illustrated catalog 10c. Top Hat, Evanston 13, Illusois.

Will, Dice, Cards, Catalog 16c. Book, Box 671, St. Louis 1, Missouri.

\*VENTRILLO Voice Thrower 25c Ventralequing 4 Puppet 15c Box 97s-PB Fininde-plate 3

Yolum nous: 4461-PX Oreene. Philadelphia 44

BE A Magiciani Large professional catalog of la est tricks like Irem d F-100 North Dearborn, Chicago 2, Lilinois

500 TRICKS-1939 Edition now ready! Contains latest, best magic for porket rank, stage, Only 10c Douglas Magicland, Dept B. Dalus, Texas

2000 TRICKS, pocket parlor stage World's Pinest Marie Catalog (400 pages) 82 50. Manter's, S-1311 Walnut, Philadelphia 7

PREE Trick and Magic Catalog 25c Castle Magic, Box 92-PS, Jamaica 35, New York

#### COINS & CURRENCY

PRES List U.S. Coins, Lowest Prices Hugh s. Box 361-5P, Bickory North Carolina.

COIN Magazine. 200 pages Sample 40c. Numamatic 7230 Milwaukee. Chicago 31 INDIAN Cent plus Bargain Lists 10c. Hutchinson's, Box 4147, Philadelphia 34,

Penns.

RARE 1880 to 1885 CC Dollars, \$5 00 ca.
Colo Catalogue 25c. Shultz, Salt Lake City

COMPLETE U.S. Coin het 10c (Refundable) Bonus effer included! Economy Saies, 186-C Doon, Manalled, Massachu-

la Utah

DIPPERENT Genuine, Poreign Coins
- Base-25c, Jolie Ros, yn Heights, New

Codebon, Box 483 St. Louis, Missouri

SHILLIANT Proof Sets-1958-82 "5 1958-83 50 1957 53 25 1956 \$3 95 1955 45 95, 1954-86 85 World a Grea est Bargain Catalogue 31 00 Deductable first \$18 90 order! Retail Goldebook \$1 "5 World Cata Book 94 00 Bebook 4514 North 30th, Omaha 11, Nebraska

U.S. coin list 10c Contains over 100 liinstrations, over 5,000 delightful bargains. Stoney, 266 Washington, Boston 4. Mass

NEW! Whitmans 13th Edition D & Guide Book \$1 /6. Sadler, Cumberland Cosp. Tests

COIMS from Pormose Vatican stepha foreign bankante 10c with com approvals. Lattlet in Coin Company, Little-ton 52, New Hampships.

SCARCE Chrome V-Ictory nickels, with warrime freedom Lorch and secret code inscriptions at 00 Heliungton, 2030 W lard Ave. Van. B.C.

\$1 DIFFERENT Lincoln Cents Complete 1861 1858 Vil to UNC 12: Wh. man Prider \$2.58 Hanotsek, 2842—42nd Street. Assorts 1. New York

INDIAN Cent With Price List He RaiM Coins Delenco New Jersey

ElijHT Different Indian Cents \$1.00. Collector's Bargains, Box 156A. New Hope. Penna.

LINCOLN Cents; 1913-8, 1926-6, 1921-8, 1924-8 1921-8 1921-8 1921-8, 1938-8, 1933 Complete lot only \$3.80. Berry, Box 306, Westminster Ca. f

BRILLIANT Uncirculated Mexican Silver Dollars 600 Each, Three For \$1 00. Bargain List With Order Universal Services. Box 675-A, San Antonio 6, Texas

20 DIFFERENT Foreign coins. & Canadian cents, and & Brilliant Lincoln cents at 00. Catalog free. Joray's, Shouns, Tenn

#### STAMP COLLECTING

U.S. Mint Pamous Americans, ic. 2c. 3c (21 stamps) Special 8 00 Prec lat Brooks 3321-T Avenue E Brooksyn 25, New York

234 STAMPS For only 100! This mammoth value includes Alymails. Pictorials stamps from a supple Comprise catalogue ing up to the each! Also Approvals, Myntic Stamp Company Camdon 55. M. X

267 WORLDWIDE different stamps only 250 Appetrum Niagnatump, St. Cathatines 6 2 Octable

UNITED States commemorative collection curtaining 11 d Sevent 10c Approvals. White, 516-W Avenue L. Brooklyn. 10. New York.

1000 DIPPERENT Worldwide Stamps 31 00. Valued over 230.00. Universal. Box 6. Kenneha 8. Winconsin.

WOW' 110 All Different Oermany 10c Zeppelins, Semi-Postals, Airmails, High values, etc. Clant Catalog, bargain lists included with beautiful approvals. Jamestown Stamp, Dept. Alsted, Jamestown, E. Y.

181 DIVERSIPTED British Colony Stamps only 10c Approvate Magastamp, St. Cathazuma 471 A. Ontario

AMAZINO Offert 300 U.S. stamps-incinding commemoratives atrinain, high denominations to \$1.00-only 100 to Approval Applicantail Limitrated Bargain Lists free Mratic Stamp Co., Dept. 45. Camden. New York.

ALBUM only 104? Hundreds of spaces! Stamperst Company, Hartford L. Com-

163 DIVERSIFIED Worldwide stamps 16c Approvas Linstamp, St. Catharines 618, Octavia.

ee DIFFERENT U.S. Stamps. Includes 19th Century Commemoratives High Values. Plus 1943 Play Stamp of necupied Nations. Al. for whit 25c. Approved Included Wilmit Co., Box 135-Y, Torkiown Beights N. Y.

NUDRS set (4)-Unusual Approvals 10s. Atles, Essenhower, Record, Wisconstit

PREE! Giant Barrain Catalog- New Edit in Dating thousands of he re to direct of g U S and B N A stamps packets, matures albums accessories and supplies sent with beaut for approvals Jamestown Stamps, Dept. ESPS, Jamestown N Y

25 DIFFERENT large American Commemoratives 10c, With approvals, Lanstamp 81 Catharines 819-4. Ontario

WORLDWIDE 50 a 1 different absolutely free just to introduce our thouse-parable approvals. Kent Stamp Company, GPO Box 87, Brooklyn. New York.

25 ATTRACTIVE Pictorials Worldwide different 10c. Approvals Linstamp, St Catherines 619-B Ontario.

PIRST U.N. Set. Among World's Prettiest Only 10c. Approvals Welles, Box 1246-V. New York City 8.

1006 DIFFERENT \$1 00 with approvals. Colden s. 5731 Eastwood. Philadelphia 40, Pennsylvania

PO! YNESIA pirl, Ryukyn lion, Chiang birthday Caecha mushrooms, taxael mushquana (that a Nkruina offer the Advance estatogs, many others free our approvata buyers, Bell Stamp Service, PSS, Bell, Ca forma.

LOOK Six Different Queen Elizabeth Mint Setal Antiqua, Malta, Virgina Etc. 12 Bicolora 25c. Attractive Approvala? Gannon Stampe, Box 531. Canton 1. Ohio.

CB Canada Catalogue send only 20c Ben Way Stamp, Laurence (3) Massaabusetts

FREE Most Set! Approvals accompany Moreo \$121 Princeton, Mempins 17 Tect same

100 DIFFERENT Austria 10c Approvals, I. Aronson, Box F Mawton Centre 65 Mawachusetts

500 DIFFERENT Worldwide from Madagasons Macao Guinea, etc., Cataloguing over \$15 with the Appreciate L. et al Stamp Company, Littleton Q3, New Hampabire.

14 000 DIFFERENTI Amesing new plan burds your collection systematics by, country by country Only 500 weekly Pres details. L. C. Wars. Stephey 78, Comp.

GID scarce U.S. seconds on apprecal Buth defective ballean prices Braze fold C. stack I Station Nemark S.N.J.

OLD U.S. Flags Presidents Commemo estives with a rown a line of funde had died Metros and Stange Box 21202. Jackson Height & New York

FREE United States Plate Brock Price List, Atlantic Stamps 45 PS Bromderd 5 reet, Boston Massachusetts

700 MIXED U.S. Various Issues 25c Monjar Pairmont, Cincinnat 14, Ob o

PREEL! 50 D Serent Portuguese Colorful treatment of Aprilonals Ethart. Box 33 Ethart Lodge a

108 DIFFERENT U.S. stemps 250 Approvate included Sheiron Box 907-S. New York S. N. Y.

INTERESTING Worldwide Antona, stamp, ec. ection. Do. W. h. approximation Magazine, 21 Cathurines 673 B. (2012).

FRYE Eight Sided stemp, Triangle Diamond Midget Mammoth to approval bases Plymouth, Dept. A-1 Sed Can lost a

U. S Stemps Giant Bargain Catalog-ISC Raymax, 35-VX Maiden Lane, New York City 38

WORLD Wide Approval Sets. David Balley Box 5021 Los Augeles his Caul

100 DIFFFICENT Stamps 100 with approvals Smith 300U Brooks College Station Texas

EXCEPTIONAL, 125 different cataloging \$1.00 inc ades transpes comprement tives 10c approvals. Recves, Box 27507P Minms 37 Florida

TERRIFIC Stamp Ba gain' Junelfeets of Vations Assertment plus exotic to stage set 4.50 Isbures Br. Ab Cr. of him. Arcumu a on Plus large stamp book 421 four offers free Send 10, to cover pestage For, re Stamp Corp. Dept. PR. Turosto, Canada 100 DIFFERENT U S.-300 Approvals, Utechta 1141A North Kerser, Chicago M

DEALERS Wholesale Cutalog Postage 4c. Franksco, 2031 Queensbury, Baltimore 15, Maryland.

PENNY Approvals jammed with Bargana For better values, try Putnam Stamp Company, Mahopac, New York.

QUEEN Elizabeth On Stamps A beautiful collection of 30 different stamps from 22 countries all bearing the pointail of the Queen of England, 100 with approvals Capital Stamp Co., Ferryaburg 10A. Mirhigan

FIGURE Franklin Roosevest Grant Triengle 25 others Different Approvass Berchfold RFD #1, Troy Ohlo

THY quality Country lots only \$1.00 Ches Wokasien, Aromica Trailer Court Hamburg N Y

SEVEN Vivid Play Stamps 25 others or Approvan Schenkel, 413 Evans, Willow (1701) Penna

CIANT-Sipp Issues Collection Lass Xirphant set Scincels Fair Obstraics Jet Asteraff Box Scout Semali At Imals compiete Romania Finga Tuge set Diamond Popet I q ed Na tons set etc plus big Samp Dictionars and Approvals Evertiting for Stamper, Box 47 KF, Waite Pound N T

NEXT Four US &c First Day Covers only for Choice carners Perlable address inbels Mason Covers, Dept PS, Bux 63 Buston 14 Mass

POLAND Pictorials—25 different 16c Approvate feet Bux 14 Aliston 14 Mass

FREE-Valuable collections -decit a in ternational and Master thebal altiums a gold mine of value all free when you key our tennational fireten approvals. Topial Box 486c, Redlands, Calif

PREE United States Illustrated Catalog H-S. 45-8 Bromfield, Buston S, Massachusetts

PREE-Same Stamp Torige Advanced Collectors Use. Also Stamps Cat. \$2 Approvals 16c. Reid 448 N 6. Allentown. Pa

ECONOMICAL 1, 3- Approvals. 33 846 Varieties. Dresel. Bux 128-7 West Englewood, New Jersey

UNITED States Who ess.e-Retail Price-list Dovie Box 85 Courtney Massaurt

00 DIFFERENT U.S. (30 Commemoratives) 25c. No. approvais. Beider berg Appleton Wisc.

PRRE 200 Different stamps, Gift Magnifier, Pres. Phootnotes subscription, Approvate Rush 100 postage, Philatelics Dept. TA New Palts New York

CANADA Approva. Collect ma Enclose 100 Peterson. Box 31 St. Paul 2. Minne-

STAMP Cleaning Service through bulk mistures of stam a no high values or a for very interesting but the handling of them sands of these is both to note this and fi time-consuming have sourcelf this druck to me. Furth set is processed separately alpaper being removed from the stamps. My special process climinates staining creasing Send the a trial lot I will ackriewiedze inimediate v and in a few da s his se row of the Irial weight processed and the total charges. All stamps will be returned to you promptly or recent of my Charges 3 lbs or ess \$10.00 per lb over 3 lbs 40.50 per lb or by contract for lance quantities in spread de iverse. Minim re charge \$10.00 Paul School 434 Old Parts Rd. Pittaburgh 14 Pa.

OVER 10 000 Different Wonderful Flan To Increase Your Collection On's 15c Weeker Free Details Write Today R. Bosworth, Jerseyville, Elinois.

TRADE your duplicates toward our approvals! Foreign on y ) Complete information 10c Vatury Stamus Box 14-3. Rewich Highlands 61, Massachusette.

PENNY Approvalst Regardless Catalogue Eluster, 6284-13nd St., San Diego 5 Ca., forcia

tion Different wordwide for approval Havers Only Jacobson, Crompond. New York 25 DIFFERENT Communicatives 1283 up 10c U S. Approvals, K & B. Box 76. Brooklyn 23, N. Y.

A REAL Bargain Washington Bicentenius, complete set of 12 stamps 25c a th little esting approvate Superior 5 amp Dept 38 Box 31, Cathedral Station, New York 25, N Y

SARGAIN U.S. 31 different Commemoratives, 25c with U.S. approvals, Stamps, Kennebunk, Maine

U.S. approvals. Low prices. Eagle Stamps. Romine Ave. Pittsburgh 26,

REIGHTEN up your Mail Foreign F.O.C. - 5 Mailed Direct. Free Offer to new sates, bere Brumery 200 Main, Peoria.

ORALING Instructions Course \$2 M C White 6662 83 Pl., Rego Park New York

U.S. Catalog free Coptains all out 1000 flastrations over 10 000 delightful bargains. Stone, 300 Washington, Boston & Mass.

BULGARIA: 50 Different exciting pictor and Ammals. Flowers. Trucks. This valuable cullect on only 15c with approva Crarles Boger, Box 152 North Wales, Petitis 1 and 15.

MYSTERY Bag Stamp Collection, Only 10c. Hill Company, Box 51, Defiance, Ohto.

100 OLD US Stamps between 1841 and 1845 51 00 Rousch Stamps, 51 Chestnat Marsfred Oing

#### P ANTIQUES, RELICE & INDIAN GOODS

ARROWHEADS—Right Pair, Four Good.
Three Warpoints, Spranhead or Hatchethead 21 00 Palmer, 425 Washington Road
McKeesport, Penna.

SELLING 100 000 ancient Arrowheads. Spearheads, Tomahawks, etc. List free, Lear s. Clemwood. Arkanass.

SCALPING Entle, Pilnt Thunderbird \$3.00. Catalog Pres. Arrowhead, Clemwood, A. Lansan

#### JO MENERALS & PRECIOUR STUNES

ILLINOIS. — Rockhounds — Visit Rockhound Paradise. Come Early Schinggate \$1 00-Azurite 31 00 Heaks's Agate Shop Weaters at Justs

MARTH Scrate - Rocal made National Mach sie S torr prior 12 de Sample 33c. Box 1317-PS Chicago 1807 Ill.

Les n to cut gettin, make jewelry Ade give sources equipment, getts for cutters culectors. Free literature. Sample copy for Lapidary Justial Dei Mar J. Custarnia

CEMS & Minerals Magazine target rock nobbi to make a Prod to per the war at the experiment at a 100 year. Sample I.m. Box 66 S. Mentone California.

OFT Free Catalog to strious rockhound sem cutter, jewelry maker, hobbylat or craftsman can be without. Pull of barear a exclusive items, low prices from largest suppliers and authorities in the field Proc new catalog just off the press—yours for the asking! Write Oriegor's Dept. C-13, 1633 E. Walnut, Pasadens Carlotta

POLISHED Gem Stones sent on approval to collectors, students, schools and hobbyists New England Gem Company, Dover 4. Mass.

SAPPHIRE and four more uncut gems \$1.00. Ten polished gems, baroque-shaped \$1.00. Pree gem list. Lapidary catalogue 250. O Brian's, 11.5N Wiston, Hosywood 36. Call

#### 31 HORBIES, COLLECTIONS

Dept 30-E, 635-P St., N W., Washington

TOY Soldsers, All Nations, Civil War Catalog 22-35c Bustler Miniatures Dept E. Box 107 Wollaston 70, Massachusetts

MILITARY Souvenir Decalt 14 Different 21 80 Box 504, Nyank, New York

SEA shells, callector's selection, fifteen 34 CAMERAS, PROTO SUPPLIES.

COLLECTORS Matchbook covers. 100 Different unused \$1 00. Catalog 25c. Album \$3 00 Charles Edriman, 13a1-P East 84, Cleveland 3, Ohio

#### PHOTO FINISHING, PHOTOCOPUS, ETC.

ROLL Developed 4X6 or 4X4 prints \$
#Episore 50c 12 10c 5X7 prints # 21 00.
12 \$1 40 Harn'r 1216 West Columbia Philadelphia 24, Funnstivania

PAST Film Service. Kodacolor processing only 75c. Prints only 25c. Black and White S Exposure 40c 12 Exposure 40c 22 Exposure Mounted 51 IS Plant Que 17 Mail Older Photo Service, Ball 287, Watertown Windowskip

TWELVE Exposure rolls 48c, Walleta 36 for \$1.00. Lincoin Studies, Dept. L. Box 13, Lincoin, Nehr

KODACOLOR 12 Prints Guaranteed from any roll \$2.50. Trial offer with this adv Reprints 20c each Ell Photo Service. But 1871PS, New Haven, Consecuent

OIL Coloring Photographs—A fascinat-ing hobbs or profitable sideline for those with artistic talent Learn at home Easy simples of rethod Pres booklet. Mational Photo Chloring School, 535 Diversey Park-way Dept. 172C, Chicago 14, Ill.

A Triple Value Quality Price, Service Cour or Black & White, 12 exp. (Black & White 40c 20 Gill Photos—61 96 Holl-day Photos, Dept. 17, Non 666, Denver Culo

A 3 in I Value-Price. Quality Service 20 Oill Photos-\$1 00 12 exposure rails (Black & White) 500 Color or Black & White Interstate Photos Dept 12, Box 15. Aurora, in

ENLARGEMENTS: Eight \$27 s or Pier 8v10 s from negarives, \$2.00. Wilart, Roz. 975 Little Roca, Ark

ENTACHHOME Anscochrome 25mm processed 5, 25 Wallet pribts from a rese for K-siscolar prints 21c Send for 1 ee mailer 2 1 Arms Court Lab Box 8025-PC Minnespolls, Minnesota.

#### 31A COLOR PROTO FINISHING

PHOTOGRAPHIC Contest! Win Kodak Automatic Electric Eye Movie Camera and Projector-15 piece putfit-Value 4049 50-Bend for entry blank, National Color Cor-poration, Box 12155E, Atlanta B. Ca., or Box 2170E, Chicago 20, Illinois.

#### 43 MOTION PICTURES, STJDES SOUND EQUIPMENT

MOVIE Comera Fi m 0 mm role \$1.50 16mm 100' \$3.00. Proc processing, He'ter Fi ms, 742 New Lots, Brooklyn, N Y

PHEE Buckhauk's big sale estatog fater 16mm moves 2' 2' color sades Bickert seartisch abyubert Poperiors rametas supp. co-big discounts (or free prery three weeks 12 page Drwste set time bargain sixt! Blackbawa France Deventors 15, Iuwa.

TAPE perouders H. Ft comprises a Sleep Learning Equipment topes I would ha ure Free Ca's or Director 68-02 174 | Etreet Finshing 65 New York

MOVIE Fign! Free catelog! Eco-H, 47th Ho. y Kansas City 11 Mo-

PREE Catalogues. 5.000 8-16MM Plans International Phone Greenrase New York

16M M. Sound Frature Figs 620 00 Bedser 5300 So Taimes Ch. aco

16MM Sound Street Free Last rington, Box 74636-9, Los Angeles 4, Cabi

10c BRINGS big new Cine Manual for the 8mm-16mm Movie Maker. Save \$88 op. Iresh B&W and Color Movie Film. Home Process of Equipment Superior,

16MM Sound aborts. Tremendous as-sortment of features \$14.30 up Land 16MM sound prajectors. \$18.50 up Cata-los Abbs Pilms \$17 West 66th Street. New York 36. PLaza 7-22:8

HI-FI, Recorders, Free Wholesale Cutalogue. Carston, 125-PS East 28, New York

104-PAGE Photographic Burgain Cutaing fisting thousands of photograptic hargains Send 25c for your copy, cred. ed on first order Dept. 4-C8 Central Camera Compatir, 236 Sc. Walmah Ave., Chicago. 4. Ill.nou

PHOTOGRAPHY For Presure or profit. Learn at home Practical basic training. Lawy much school of Protography, \$35 Di-tersey Parkway. Dept. 172C, Chicago 14,

SAVE Money? Clant 1859 Photo Catalog -Over 1 800 items! Fully illustrated fealuring the finest in national, and internationally known cameras leaves acces-35c to cover mailing and harding to Base Camera Co., Dept P 456, 175 W Madison Chicago 2 Iliano a

#### MUSICAL INSTRUMENTS. MONG WRITERS & RECORDS

SONGPORMS and lyrics wanted Mail to: TinPan Alley, Inc., 1830 Broadway, New York 18, M. Y.

SONGWRITERS Record or Company Wants new songs Royalts base National Sales promotion 5 selected No charge I to Relation Bend materia. Music, Marie ; Makers Dept O-36, Box 2307 Mullywood, Сан пятна

SONGS Into \$688885-Share \$13 million do rate reacts for New Sougher tere Bongports Any autient mengs romposed polition, appraisal Free Send Nord to M or Pub. of res. 0000 Sunset Moth wood MPS. California

SCHLWRITERS! Protect your ideas Hold all prema solute Write for safe cor-rect procedure Song Service, Dept. Ph. 191 W 56 h New York 18

PORMS Wanted for musical secting and recording Send powers Provestance attor. Court Music Company 40-P West 33 Street New York 1

ACCORDIONS—1850 Models. Lowers whitesale price Sare up to 75. Precomme trial Traces accepted Big color Box P. 2003 Chicago, Chicago 22

OUITAR Making books plans, imported woods, tools, List 10c. Wildwood, 516 East 11th Street, New York 9, H. Y

SONGWRITERS, with publisher con-lects, want sone ideas Abare toys it we had been a Set quiller A verinies 1630 Brosdway New York 19 P.

POPMS narried for inusical setting Estab. and 10 9 Crob. 2181 Bedfurd Ave. Brooklyn 26 M T

PORMS Wanted Immediately for Musition. Bush Powns. Son't falters, Ackien watern Nashville, Tennessee

SONGWRITERS—A Publishing House for Amateurs. Pres Music-Pres Lyric Course. The Amaleur Songwriters Association 1356 Hancock St., Quincy, Massachase to

POEMS Wanted for musical setting and recording by America's Largest Sons. Studio. Send poems Proc examination Five Star Music Masters. 646 Beacon Building Beston

WANTED Songs and Lyrics for Nationally Advertised Record Label, Broadcast to Milliogs, Co-operate with Componer C. Isabel Mayer, Box 3896, Portland 3

ELECTRIC Guitars, emplifiers, wholesale. Free calalog. Carrin, PSM, Covins, California

#### RADIO, TELEVISION. ALPPILLES & EQUIPMENT

COMPLETE TV sound rulof, install yourself, \$2.00 prepaid or COD. Warren 106 E 46th, Austin 5, Texas.

COVERNMENT Suip in Shoops scotes Hart Count M be Dr ec'ors, Palabook Heffectors Telescopes, Pirture Calalog 18t. Mesbra Ma.den 48 Mass

WALKIE Talk on Hand Street Citizens Band Two-Way Hadios, Antone May Op-Sereial Miles Range \$49.95 634 86 Free Information Dixon Electronirs. 13444 West McNichols Detroit 24. Michigan.

RADIO & TV Tubes at Manufacturers Prices! 180% Quaranteed Brand New! No re-brands or puls United Radio, Bun 1000, Newark New Jersey

NEW! Pocket-Size Probe Will Substitute Battery In Most Transistor Radion Translators, Selmium, Silicon Rectifiers In-Circuiti Many Other Uses \$4 61 Write Eine Research Laboratories, \$61 Sq. 11th, Maywood, Ill.

POLICE Calls from Car Radio with this precision designed translatorized roo retter Simple Installation Heat res No Internal Connections, State transvery 278 65 Free brochure, Robin Radio, 12736 Red Parn, Dallas, Texas

ELECTRIC Guitars, amplifiers, whole-California

#### 37 BUSINESS OPPORTUNITES

IMPORT-Export opportunity, profitable World-ette mati-o der business from Fonce un hauf rapital or traval abroad Established world trader abija trateur-Ess Les Augein 34 tions for no-risk examination. Experience

S'e WERELY-Home, spare time. Sunprified mail bookkeeping Immediate in-come-easyl Auditan, \$4757D, Los An-

11 000 NEW Prespects Daily, Baby record books, shore asbume field mailurder Une our life at ure Write, No-Co-Ra, Capitota, Cartternia

TOUR stretepm addressed accurately, reasonably Fast service We have causble addressers in tour city distance distance, then been distanced to Ohio

NEW Home-Import Mail Order Profitunit) You ma box stures with motion No he bing No reperture He investment We supply everiff in Yese Details Mail Of her Distribute a timpoet Division of the Attention 4, 1920. 15701 South Brondway Los Asignisa 4:1920.

YOUR Own Import May Order Business? Den. w. fr over 400 mistiglacturers reports ers of the world Comple e In-port procedures different unal despish p methods to, al uniterrated Fire delays. Associated Box 3066 PG South C to 6, form

mess. Write Walter Service, 4156-B East 112th, Cleveland 5. Ohto

PRFF Causing Contains hund rife of Bus meases, Parma and discoure a pertonal front of the Contains Special type and location deals of Deal dated with thought Dept Discours Discours Dept Phys. Lem August 27 Ca. f.

QUICK profits with he capital orders for macadines that he a mes fike ye t. Make cash on the spot! We show how with Free kit. Out yours now. Write McGregor Magazine Agency, Dept. 341, Mount Morris, Ill

EARN Money At H the rapiting fishing rms. for us Base a d to age bases t We buy your crop Inquire. Oakhaven-42 Cedar Hill. Texas.

FIE Typewriters. Free Ropair Course H ene o, wrated. Remit 25c for book en-plaining Free Course and Avency Appointment. Ather, Tarentum, Pa.

GROW Orchods at home Profitable fastinaring, buttererara bunter attamen enspecial light, temperature and humidry conditions orchids need Pres-Fig. de-teils. Orchids, 100 S. Vermont, Les An-peles 4.

MAKE Extra Money-Big Cash Commissions phis premiums for you and your Gus Hi belies deserts others All sizes Free Master & 1 makes bet in the car no tractus e necessaria Bape or March Dept PX 030 75:00 Greenwood, Chicago Dept 19 Diamon

**GROW** living Miniature Forest (only inches high)—or orchard that bears tasty tiny fruit Learn amazing Dwarfing se-crets! Familiating hobby' Profitable Home-Plan thate your age ! Mrinture Mure-eries, Dept AT Gardens, California

PLASTERCRAPT molds hauld rubber plasters, flocks, candle supplies. Catalog and manual free. Jayhawk Plasters, Blue Rap.dt, Kansaa

GAME Warden, Government hunter, Processey Park and Wildrie Bersices and number published open not An architecturity Comparis information Free Wills Forestry & Red to Cuarse Dept. CC 38 1038 & LaBren, Los Augeiro 19, Cantonia

EARN Good Money sharpening chain saws schools cur ery his rea Free Man us: Treyon, North Tonnwands 1, New York

MARIERTS Everywhere Make Artistic convece birdhights pot ery Best coloring Home wortshop Handrig in ever Hous wood Comunically 5-27-30 Wonderland, Hollswood 46 Camforing

NATURAL Moiding Rubber Evera. Thick. Free Sample W Manage, 1016-25 Die a.d. Pecria. stations.

CPPORTUNITY to care \$15,000 230 800 and an a Present se protected Cranted on 8 3,000 bank Live of home. No merchan dies to but de femule ed One of must en quive and non-ompetid to Bus nesses th Us ted States and Caranta Send for tree explanatory bushles. Married and Company, Box 8-D, Louisvale, Ellinois.

MAKE fiverble molds. Cast plaques figwritten. Pres sample. Tooker, ipes-A Fairview, Hamilton, Ohio.

PEPCHE start of any manuscrier bustness read. Me is der Laws and Reg. ations and Me order Roben for Ber ations 2000 L. stare calms legal requ. cments expansed Tasker, Box 3131, Auxandran, Virginia

\$75.00 FIRST week in your own mut)
neler bus ness Complete Efficiers F an
Home operated spare-fold me Every
thing supplied Walness between 2016 F-1
Chathang NE, Washington 15 D C

\$2.00 MO. BLT Typewriter required. Confidential home-netup 25c. Interstate 27.0 Peach, Arbany 8. New York.

COLUMN EAZED Consists platery made without minds Puteried method Completely predicts noted to the Basement leak sea a Money making projects book let do not free Men may Na sonal Potteries Count Rapids Mannessa

AMAZINA Profit making reterrite drain tile Deta is free Custon Products, Curbeda Georgia.

CASH from Bawdust, Tit.-Lans, Hewspapers, Over 206 methods, Instructions \$1.00. Charles Company, 42-DPH Nocwood, Ohio.

MAKE Durable building plantic seally. Beau, ful - 10) uses \$00 profit Bays Laboratory Evans Canyon Assessa

VENDING Machines—No Selling Operate A Route of Coin Machines and Earn Amaring Proprie 32-Page Catalog Free Parkway Mail no Corporation, Dept. 18 1/2 Ensor Street Ballmure 2, Macyland.

\$750.00 WEFE profit possible Earts at hothe space time with Inscriniting Pr. time method \$8 starts one-send his more than Pres Confidential Pasis and Valuable Samples Screen-Print AT Los Augeles \$1.

MINE Raising information free, Complete Lake Superior Mink Form, Superior EE Wiscoung

PRANCHINES make profits' Have your own prosperson frauchine business Opportunities nationale for dutr letters dealers national franchise Reports, Y-526, 333 Burth Michigan, Chicago 1

MAIL Order' Sucreed with your own Gueranteed Front mail order business. No above ory We dropenip and show you how to make his profits. Write Giftime, 519 Walkit, Dept. GPS, Philadelphia, Petitasylvania.

BARN \$10,000 Selling Books by Masi. Box \$1-BAA, Des Plaines, Illimois.

\$100.00 WEEKLY spare room, Raise redworms and less dury Ottorious Charlie Mornari Box 1.00 Bushied, Florida

100 PROFIT No serling Quick profit plus steady income Rush & at for particulars and hargain cataog Earl Enterprises, Dept. F. 6148 So Sacramento, Chicago 20

FREE Name Stungs Catalog! Your swn blan profit business Se. Name Brands luit or part time No toventoty - no tovestment More than 2004 Name Brand ... ms south wholesals priors Watches innerly tomerat. h. S. attree index phonos application housewarm hardwarm power tous larguage musical instructors a garden equipment, sporting goods tors many of sers & Ploors of Name Brands Mr. son to ar inventory Orders shipped complete mittle 16 hours Bend for Pice beau lusy trustrated catalog Now Separate whosesals price list. H. B. Davis Corp., Dept. 14, 146 West 15 St., New York II, M. Y.

MEW Bathroom Decourizer, Eange en wall, Bantahes eders bathroom, kitchen Lahtning seller Samples sont un trial. Enstee, 198. Akrop. Ohio.

MAKE \$19.000. Yearly! Fire Adjusting! Free Details, Sterlings, Corona 68. Hen York,

PREE Laterature - Make Hig Money Raising Fishworms and Cricketa, Carter Farm. Pleins, Georgia.

OPERATE Local Co lection agency Pays big Free by leain. Franking Credit Ho-

WANTED Men Women Raise built for me at home Puls space I me I heart take up space. We Jurnish everything Sherwood, Dept. N. S. Mormouch Maine

FLOK ERAPT ("bristman Trees" Earling Profits apraiding a dictars of eap from a set to be as a full criorfu. Cashiners will have all as being 10 times of a had tree cost. Be first your area ("16 ( ristman Free Sample and bushlet shire in 50 times of Ways To Earling Foot Kraft Profits Foot Kraft ATE. Los Angeles 51

EARN 500 830 A Year front your own mail order business at home Proved program Pres details Detaing Research, Bon 52 C Buttington Inva.

\$1.00 HOUR home sparetime assembling pump samps East Free Details Outer Condwell, Arkanana

MAILONDER to motels published churches mattations Complete Endridual strup bot ast a structures Hermin Advertising 162-G West 42, New York City

WHOLESALE Prices, Vitamins, Minerels, Herbels, Nutritional Products Formulators, 1548 Southeast Clinton, Portland

PROPITABLE Mailorder Operation Write V hart 400 PS Third Avenue Sail Lake City 4 Utah

PIANO Tuning learned quickly at home framer done held! Munical En wiedge unnecessary Information free Empire beheal of Plane Tuning, Ellimon, (Founded 1910)

46 000 MEN Women' Work Home Sparting Free Couffdential Plan. Scott But 300. Great Hock New York

OPERATE profitable mailorder business? Write bond, 1677 R West Vernon Phoenix Arlanda.

BAKE New Greenstein Doughtuta In Etchen Sed stores Fron ter pre Suntiers. 16th South 15th Mintenpola T Mintenports.

LEARN Currespondence School Operation & Management Start your own school Use our lessons & service Whosetals only Write Lessons', P.O. Son 652. Enriso California.

STOP Looking! Get exchaire franchise Choose from large tange of offers Free bulletin Pranchise Previous 30-D, 1210 Standard Building Cleveland 12

Mail Order opportunity magazine lite Morita's Firmede Shopper, Bagins W. Mich-

834 70 TWO Hours Manufacturing Concrote Products No Selving Carlayn Castings, 1963 Premont, Rapid City South Datota.

the WEER'S T addressing envelopes clipping newspapers Detailed instructions \$1 relundable Ches Beants, Box 200, Greek Neck. New York.

PREE Cutaing Easy to make contume and shell jeweley Profile up to 5 times coats' Modern Craft Son 1766-PE. Saint Petersburg 32 Piorida

LEARN & Trade Free List Used Courses Sutchisons, 4167 Homphilis, Port Worth th. Texas.

PREE Report 800 Odd Successful Busibessee Box 1801 PhD. Evention Hances,

LIQUID Moiding Rubber Free Sample Stretcraft Supplies, Chancy a, 1867-6, East Road Jackson and 11 Pin

MAKE 844 From Square Foot Fibured Junah necessary Free Details Woodarts, B strewater Mass.

PREE Business Pranchise Protected Have Own Office Bell-erspicied Na ionwide Trave Service Deta a Free Popula And Company Box 23 Berdiam Menticay

EARN \$100.00 Weekly part time from your arm-chair and in one year you'll receive a Free Trip to Europe for two. No selling or mailorder Pan Pacific, TDS Box 105 Leguna Beach, California

NOW'S Time for Profitable Weatherstripping, Write E-Z-On (PS), 1808 Rarvard Terr., Evanston, 15

EVERYBODY Little Candy — Make Profess mair Home (Our 48th Year) Ragidale Candies DIST Bass Orange New Jr. 65

BIG Profits. Your own business. Pull or pert time. Little or no capital. Details free. Business Books. Box 8-B, Plaistow, M. H.

PORTUNES in Formula greatest money-making idea Sook in the world Write for free literature, Rollin Hall, 20-10 West Jackson, Chicago 4 a.

IF You Like Motorcycles And Money then send for Harley-Davidson Designably Book on how to become a franchised design of motorcycles and a new line of motor scooters, Here's a chance to own your own business with a very modest investment. The you's market is beginning to explode and the heat few years promise a chance to cash in on it. Write for free illustrated Dealership Book Today. Harley-Davidson Motor Company, Dept. P. 8. Milwaukee 1. Wisconsin.

## MONEY MARING

DETECTIVES -- Work home-Travel, Experience unpercessed Delective Part ulars free, Write Waroner, P-125 West, 94'h Hew York 36

SELL Titania Gems far more brilliant than diamonds. Catalog 16c. Diamonite, 2420-2 17th, Oakland 5, California

MAKE Money Writing Short Paragraphs Information Free Barrett Dept. C of J 7666 No Clark Chicago M

EASY to start rubber stamp business at home in spare time. Make up to 30 80 an hour without experience Parts free Write to Roberta, 1813 Jarvin House CH-2-M, Chicago 36

ALCMIN' M Auntres Alum num Biding Fac ory Prices' Bed Heig born' Write Dana' Bus 1966, Tampe, Fio. ids.

HAMMER! Baw! [21] # 8100 Weekly Jet Ham 423 Encondide. Caulottic MONEY Making and Saving Catalogue

Wrie Adama Incharge, 2:6 5th Avenue, Hen York 18 New York

MONEYMARING Vending Marhines Calle Sakes set Spring Garden, Phila 22 Petities rants

MAIL Order Sames Areid losing money through errors of judgement Read I was writing about that by Ar hur summore Send for free copy John Bishop, Son 1880 Opal Co. John School,

AMAZING successes through franchises? Become exclusive franchise bodder your term or Information rashed National Franchise Reports, SP-536, 332 North Machana Chicago I

START flig-Par luminess at home in spare time No experience needed to opera a r II the table top machine for bruring laber above. Make 35 66 profit on every pair Pu'l particulars few Send particular to Mason 1512 Jarvin, Room CM-3-E, Chicago 26. Il mois.

MAKE \$5 000 yearly sparetime raising mink chinchilias, nutria etc Pres busket revens proved plans Write Purs 568 Mt Psesant Road, Toronto 3 Cariada

BIGGEST Spare Time Profits showing friends, beighbors benet ful Evans Christmas and All Occasion Cards Easy to take orders (106 , peoff with aperts) bit sent-on approval Included Free 13 samples Personaused Christmas Cards, all new Imprinted Stationery Dispusy 2 Catalogs, Sential Guide Write today New England Art Publishers, North Abington, \$53 Mass.

MEN — Women! Start Money-Making Plastic Laminating Business at home in spare time Material that costs lie brings back \$758 No canvassing or seeing but mail orders bring in \$26 a day Write for full particulars Free Rush name no postcard to Warner Room CL-3-M. 1513 Jervia, Chicago 26. El

\$35.00 WREKLY addressing envelopes Instructions \$.00 Refundable. Adsertice, Spring Valley New York

WANT Money Making plans, ideas? Belson 40-46 Ithaca, Eimhurat New York

PRES Literature - Make Big Money Raising Pishworms and Crickets, Carter Farm-11, Pistne, On.

\$30-300 WEEKLY addressing envelopes for advertisers instructions \$1 refundable. Ryco. 2:0 Fifth Ave., Suite [192-8]. How York 10

STOCK Market Profits' Proven method physoints dynamic leaves, prevents heavy losses Start small—expand consistently Write Treasury, 100 Webster New Roche to P-1 M S

REPAIR Hydraulic Jacks—Learn High Paying Trade—Pollow Simple Instructions In Lightrated Trouble Shooters Manual Covering All Models \$3.56 or C O D Hy draulic Parts Supply, Box 5665. Washington 11. D. C.

MAKE Up To 100% Profit In Spare Time Sell 76t brand new, unusual "fast selling" items incoding amporta jewels toys greeting cards household wares, and tellector a tems No experience necessari No obligation. Write for big colorfu cata log just off the premi it a free Sam, and on approval North Star 5-736 Pubch Bidg St Paul I Mannesons.

MORETHANDET opportunity New Unique item, Bend \$1.00 for sample, refundable. Mark Manufacturing Co., Ottroy, California.

MAIL newspaper citippings daily for cash. Ketcham & Advertising, 1668-B. Sp. ngfe d 1 cons.

2340 00 MCNTHLY with Juraw Details Eikman, 345 North Summit, Sidus Pails. South Dakota.

MAKE \$5 000-\$10,000 or more yearly at home in respectable field. Only 2 hours week y attention needed. No Experience canvasaing necessary? Exceptional, but true. Few do are starts you Just \$1.00 brings complete detailed plan. But stact on Charanteed. Columbia Enterprises L.d. \$265 PS. Piney Branch Road, Silver Sp. ng Mai) land.

OPERATE home Mail-order Business. Vocacek Printing, 4444PS Ute, San Diego 17, Calif

MAKE Money Chapter Newspapers For Information write Newscraft, Ph. 863 E. Main, Columbus S. Ohio

WANT Big, Steady Income? Orow Red Wiggler Fub Worms! Guaranteed Market we pay you \$1.50 pound! Red Wigglers Watsaw 1 lociona

\$15 00 THOUSAND! Addressing Enverlopes For Advertisers! (We Make No Palse C'a.ms) Other Opportunities offered 30 Firms! Details 25c. Barrie. Box 1241, Woodhaven 21, N Y

BUCCESS Ahead Assured Extra Mones Prom Profitable Hobby Absorately Cumplete Way 41 General Explanation Free Burress A 4. RDR#J Nation New Jersey

EARN More money Know and capitalize on your abit the Free I Q Test and information Write Today Associated In at tale Box 4, Manhattan Beach 4, Callfornia

CIGARETTES- Make 20 ft tertim for the Parts free Moheray, Box 912, Owens-hore Kentucky

MARE Easy Money Address by Mailing At Home! Write-Merrill Histand, But 187MP Hattleid, Pa.

#### 28A BLY IT WHOLESALE

NEW Multicolor Wholesale Cataing Houseware, apparances clothing a nerware, tookware, luggage benormary shavers, radios, phonostaphs cameras projectors, recorders, typewriters seeing machines, furniture power tooks took sporting gnots watches diamonds jewel-ry automobies, etc Name brands Huge discounts, Pusicard Besbyos, Decatur 171 Thronis.

LARGEST Wholesale Supply Source in U.S. Get free catalogs. Furn ture cothing app inners, autos and accessories, farm eq., pment. to: a housewares hubby supplies Free details Associated Wholesalers. Box 2066 C. Sioux City 4, lows.

BUY Wholesale 180 000 Nationally Advertised Products Appliances, Cumeras. Sporting Goods. Housewarm, Watches. Tipewriters Tools, Cothing etc Discounts to 10°, Buy-Rits, Box 258, Hawthorne 108, New Jersey

SAVE Money Buy wholesale Watches, juvelry radios electrical appliances cameras O ani catalog \$1.00 Refundable Share Datribu ng Co., Box 2371-PS. Jacksonville 3 Florida

BAVE 36 Purchase Everything Wholesaid Automobiles Trailers Homes Boats Magazines Pood, Purtiture Write Wholesailers 177 Jacksonville Lillings.

ELECTRIC Guitars, amplifiers, wholesaid Pres Calaing Carvin, PSW, Covina. Caufornia.

#### FORMULAS, PLANS, ETC.

SAVEI Recisiming used motor oil, Reuse. Formula 31 00. Acme, Box 542, Birmingham Alabama

PORMULAS—All kinds, Latest products Literature free, Kemico, Park Ridge 15, Ill.

PREE Largest formula catalog Big Surprise Western Chemical Salem, Oregon SPECIAL Pormulas for latest money

SPECIAL Pormulas for latest money making discoveries New! Good! Priotable Valuable Literature Prior Misser

15 000 PORMILAS Trade Secreta 500 Pages 23 95 Refundable Circular Pres Marien, 1100 Saumoral, Chicago 40 Listinia

LATE Mutern Manufacturing Potmulas List Free Chemical Beiston, Martrise New York

#### PLASTICS

LEARN Plastics Fabrication For spare time sicome. Low cost home training now available Write for free bookert Interstant Training Service Dept D-2 Portised 12 Over in

LAMINATING Supplies Price List Prog Sourceson 44 Cornt to Boston 8 Mass

SEND For Commete Ca a of From The Planta & Center Of The World Kaufman G am Comment Plantics Division PS, William 1 gion 99 Delaware

PIFXIOLAS - Any thickness Clear Courts Cut to size Clear Rods-Tib and M Claim Piestics, PO Box 1845. Hancter Printeriorable

NEW Liquid cast ng plastic trent colpra Embed real 2 were butter? re-photos callas Send 25c for two handbooks How to Cast Liquid Plastics and H wto Make Extre Milier at Home Castolite Dept J 102 Woodstock J nois

PLEXICLAS Source foot cost 1 et al 20 al 2

EVERYTHING In Plastics—Specify to terest Or. Send \$1.00 For Master Catalog GEL, Box 261, Union, New Jersey

#### D SCIENCE & CHEMISTRY

TLI USTRATED Calalog Chemistry mineralogy biology 25c Tracey Laboratoiles Evanston Lidnous

ROCKET Supplies and Chemicals Catalog and Plans 25c Refundables Central Rocket Company 888 Waupaca Will

CHIMICALS and apparatus for industria, and stick, and private interatories Catalog 25: Dept M 26 B plog a Supply Co 1176 Mt Hope Ave. Rochester 20 N Y

BOOKLETS' Chematry Physics
At record Y Science Relating
Electrony "Hadio Light Tables
Malhematics 15c Each Franks, 3121
Sould Racine Chicago &

AMAZINO New Book Of Science Expertments Formulas, and Catalogue of Laboratory Supplies On v 15c National Scientific Co. Dept. PS 4, 13 S. Park Avenue Lombard, Illinois

NEW catains low priced chemicals apparatus biologicals microscopes Cataing loc Wints Chemicals, 124P West 21rd Street, New York 15

SPECIAL Chemicals, apparatus, glasswere, biologicals, Catalog 10c. Bio Chemical Fraducts 30 Somerast Street, Belmont 75. Massachusetts

EXPERIMENTERS Terrific Bargains Gaiore Ca siog life Hagenow Laboratories, Mani once Wiscord in

#### 42 MELP WANTED REPORTS

JAPAN Kores Otonews' Many hispering John standage Ail Scide. Complete, detailed reports \$2.00 Walts, Buz 803 C.P.O., TOKYO

COPYRIGHTED Reports Best paying companies travel adventure promit one Construction evantion of poing nufleids inhorers, rights trades supervisor factors unusual opportunities Bk (sed unshilled Printigh Satesiae Otto \$2.00 (\$2.3 Arrms + COD's A repted) factor quaranteed included fee Special reports on Ansha Venezuem South America Remeat b Services Meramed Building St Louis \$PS Missage;

AMERICAN Overseas John High Pay Men, Women Transportation Paid, Pres Information Transport, Dept. 170, 200 West 24th St., New York 1.

FOREIGN John-Latin America, Amaka. Canada, up to \$ 100 morths. Up-to date 1939 Foreign Berame Du ectory gives complete information, but list of firms his near Martine. Oil Exporters-Importers, Minling How When Where to up 1: 11th Successful year \$100 Global Reports, But \$4073-F, Los Angeles \$, California

JOBS on Shape Write for free information World W de Semmens Service Box 1445 Ph New York 1 N Y

PREZ Information - USA Oversens Jobs High Pay Transportation Put era. Dept P 215 West 24th Street, New York City i

JOBS on Steamships Ya . to traveling foreign countries Davenport s. 1364-J GPO New York 1 New York

JOBS Overseas Write Janecek Development Co. 100 Hult Station New York 55.

WANT An Overseas Job? In ormst to Free. Employment Information Headquar ters, 76 Wast Street Dept 5-B New York 5

MONEY prestige pleasure work over seas 8 05 hr its companies mations districtions. Vision, Non Mail. North New Hyde Park, N. T.

JOB Seekers reports from U.S. Government on Federal Employment in Alaska at diversess the atting information on stalls were ed where to at the Also over two names and addresses of U.S. firms operating in Spain, France, Germany England Japan America Turke Velectucia, many other countries, Also included Pres aperimen questions and answers from U.S. Civil Service Examinations for Typist Stenographer: Clerk, Hurse Postal Service, Stock, Policeman, Engineer, Wildlife Flabery, over 80 other job titles Only \$2.00, airmail \$3.00 Satisfection functured or related for your more back Coarde Dept 101 slot \$64 Dansa 21 Telas.

JOHS Shim 0.20 Weekly Designers Trace. Adventure Details Free Seamans Service D. s. " P. B. s.s. n. S. N. Y.

#### 43 AGENTS WANTED

FOUR own bus ness Su to \$1.50 Overrests \$50 Markinaws 350 Shoes 12 o Ladies Coats 300 Dresses 150 Enormous profits Ca alog Free Nathan Porthus Associates, 2108-J Roosevelt Road, Chicago 8

AGENTS 300 profit se ang gena ne gold window letters, stores and offices free samples. Metallic Sign Letter Co 17.7 E West Newport. Chicago

GOLD or S. yer letters numbers Windown Doors Trucks I" to 8" 500 . Profts Pive Samples Atlas-U 544 West 78th Chicago 20

EVERY Man A Prospect Request Pres Sairs Ett abnoring line of belt built est the classes, money clips cull links, lapels, individualized with customer's name and emburns also cup badges for Irushing bus, tall policy firmen Choice I 900 emburns Hook Fast Box 1425-PS Providence. Rhode Island

SARH big communion full or part time Burid profitable business of your own wilthe America's cargeal cine son priced busi-peas pri cing 368 page facating namines hundreds of fema used do y by bis cas prop a Advertage Special y Line fratures income as the St. for 100 Calenda's low as \$5.00 for 100 Free Sales Ent. Marional Press, Dept. 8, Mortia Chicaro. Lucion

WANTED. Fire extinguaher salesman Rural areas. Out-O-Matic, 1737M E. 31st Denver 6, Colorado.

BIG Profits - Stamp Social Security Plates Key Protectors, Sample—50c, Catalog Pros. General Products, 188-PS State. Albuny 10, M. W.

START Your Own Business On Credit rt B and Camara, Your can han (48) Denora mid \$5 900 in \$11 500 in \$50 We supply at the postument on field to 200 biene gegen en da en experier e ablier by world a c'r more by W. to Passeigh a Dept. H. C-PSC. Prosport. Himself.

BLSINESS of your own. Earthoug potent they as high as \$40,000 and as it larged on \$12,300 base. No mericannuse to has deput for free explanatory booklet. Harrell & Company, Bok 8-DD. Louisvilla, Il.

SENSATIONAL: Make \$50.00 day. Write for details. National Distributing PE, 1751 W Fingler St., Misses 25 Fig.

MEXICAN art goods! Free Sample! Send 16r stamps maning 8 bias Apartado 6636, Mexico City

CHRISTMAS Cards in the restource a name ample ted the and appear of some Specific and but reliance has never design a all in one attractive presentation a bam that actuarly seds for you! These deluxe cards pay deluxe commissions. Earn \$300 to \$500 tolus Bornses; enally between now and Christmas, even in space time. Sales experience unhoressary Old-established manufacturer, Pros Sales Kit includes Sample Album and complete easy-to-fol low as any instructions, Bend for K t nonand politer poffs herr week. Wite Price orp Dept 5A 1954 S Tree Chicago

MAKE Money se hing sensational Dwarf Trees bear t and Alse Apples bat Burbant Pre s O Games a Alen Standard Trees Roses shruts, Vincs etc. Outfit Free Stark, Dept. 30100, Louisiana

MEN-Women Agenty Sensational new Berigten facilities plantic personanced tills of the arrespentafurnished tings bear side a create ste bing y take orders purket to commission sout we do wer add occurry butter outfit free November 234) North Avenue, Chicage 42

CALENDARA Adver sing Matches All styles, including Religious Varnashed 13 sheet. Cirls, Hundreds of Advertising Noveltses, Book Matches, etc Fleming Calcidat Co., Promotions) Divi-sion, 434 Cottage Grove, Chicago 37 Ill

SHINE Show Without "Polish," New invention. Lightning seller Sitors glessn-like mirror Bamples sent on trial Kristes, 64. Akron. Onlo.

TARK Extra Income Without Changing Jobel Use your spare time for profits. Show and sell fast nature town a fix great ing cards gadgets novelies to:a, jewelry and comme, to make up to 97 proft Witte today for free momes making hit and his relectus catalog, have use on approval No observation is retained to mitted, 1-302 Park Square 64 Paul . Mirete

EASIEST 400 to \$100 Yes II Keep Make Etc. Link new Southern Beauty Chips mus Il Ceramic Gifts pur huge pronts Pres 26th Anniversary necessitized Athum. samples on approval Specia Ambrersam Free git affer Write Sea hern 4.8 M Hollywood, Dept. M-36. Memphis

SELL Bowling Shirts with placers hames, team emblems enfortuily embrondered. For men, women, Entire teams. leagues buy at low prices. Make \$500 monthly extra. Sales Kit Proc. Master Dept D-16 Lipottler, Indiana.

SELL Covered Wagon Lamps Big Profits. Details Pres. Caritty 1011 Elton, Baldwin Park. Cauf.

ANYONE Can Sell femous Hoover Uniforms for beauty shops, waitresses, nurses. doctors, others. All popular miracle fabgan ity Big cash income now, real future. York 11, M. Y

250 PROFIT setting amoring Spark Breater Pop Up Care True to Tractors ake new! Install in one minute. Instantly improves performance indeage pleaset to plus founding Charanteed \$2.00 postpoid. This is a go getter Free Sales Letter Brochim Products, P-2548 North 13th Street Milwaukee & Wiscontin.

Will you wear new suits and topcoats without one penny cost and agree to show them to friends? You can make up to \$36.00 in a day even in space time, withput call'attains J C Field & Set Lic Dept U-1828, Harrison & Throop Sts., Ch. ego 7 Hidneis.

RUN a spare-time Greeting Card and Oct Shop at home Show Iriends samples of our new 1959 Christmas and All Occasion Circeting Carda and Oifts Take their orders and sern to 100's profit. No experience necessary Costs nothing to try Write today for samples on approval. Read Circetings Dryd (3) Perudale Mir blann.

EARN \$17 800 Yearls-Only 19to MARS de . Word . Best to er The Hilly Bibel (Liustrated) Protestant of Cathour Mar-

SELL reconditioned spark plugs From ten ) Texas

BEAUTIP''L Peather Pictures Free Oc-Table Hample 30c blomps Apprinde (806

MAKE Big Profits Quick Take orders for key tag & key protection service. No manner needed Allatace Kes Return Serv-ice & & sind & New York of

TREMANDOUS profits! Every woman and rhold a customer Suits \$ 36 Panta 25c, Dresses 20c, Shore 20c. Operate from store, home, car Free catalog 84perior 1230 B Jefferson Chicago T

AELL Real Estate And Service Signs. Frammie, \$3.30 Master Philadelphia 31.

#### MEGH-GRADE PALESMEN

MAKE Setzs Money-Big Cash Com-Biles one pita prein and for you and your Armen frital new Terranma. (camus) Com it absolute dances others All sizes Quelt da y same big repent business Free Mas or Est makes or inc dany-incomplete. F necessary Supersoy Match Dept. F ass, 7530 Greenwood, Chicago 18.

IP you ex interested in making money in selfing nor the hundreds of specifications. is not the bundreds of except ones. Appendix lines in Selection a Copporation ( agasine Send name for your cops absoluters free Tell as what can re selling now Opportunity \$48 M Desciors Dept 16 Chicago 16 Districts

\$1 800 00 4 month for making by t teriebs Prento Pire Extings ther cherescal used by arrioter scalls out fires instantly. Only \$4.96. Terrific commissions billibrate mant at Pres Kat Mer 1.6 and K 32nd Dept. P-60C New York 16.

MAKE Dires Money selling advertising may thronks Free catalog and supe mittle | Matchrosep -Dept Po 88 Chicago 22

mage me tells you bott and where to make more in mer oft rout own in selling Write Specialty Salesman Magazine, Desk 6m 107 North Michigan Chicago I

\$10,000 a year selling atest aberting parts bine rabinets shop equipment Sold everywhere Terrific committee at the Peer 17 page catalog. Jobber discouts a RFC Cor-portition, 20072 Hedden Phila 27 Pa

WILL You test new House in your home? Surprisingly hig pay Latest conveniences for home our Send no money Just your name Eristet 35. Akron. Ohio

Bitti Money making Opportunity Exclusive line uniforms, jackets pen a st rts coverale spotteness Advertising embroudered Every business prospect Cet Selling Outfit Pree Master Co. Dept. D-18. Legopier, Indiana.

FREE Successful, "No Selling" plan for earning \$5.00 to \$10.00 hour as our service distributor, your area. Keep retail stores to be and with Re one never acres to miracle of cosmette world? Write Meche Mfg Company Tr by Fiorida.

SPECIALTY Men, Salesmen - Build permanent income \$50 to \$ 25 a day year round. New a descripted by ear approved for all military, residential, commercial, ir functia, rataliations. Wille for detain. Eurger 1318 Champters Housen 3, Team.

LAWN Ornament birds, Jockeys, Sub-ctait, Lamps displayed in your yard self-feet Write Cuttified Products, 110, Louis-Marie 16 Mari

CALENDARA Printing Bigget remmin-Motas Experience un recessors. Outflix furmaked Furster, 1336 Ardmore. Clucage

#### RIDUG ATRONAL & INSTRUCTION

LEARN While Asleep with your recorder photograph of sma 's new Electronic Educator endicas 'ape recurder De's la free Basearch Association, Non 34 MH, Olympia, Washington.

BOOKERPERS' Increase vous earth-ings Crietate cour own remained Ind-iar A Week Bookkeeping a d Tax Serv-ice Pull or spare time Details Flee Ho obligation Ellis, Box 201 Ceder Grove Mutth Caroli a

EARN White You Learn Auto and Diesel Mercianics Master that top payout thene Many graduates care \$100 a neck and op Aggreed for Korean veterata Por free information were Dept. No. 262. Nash-T+ ha

MASTER Watchmaking at home Proc sample season Characo School, 2329-WU Milwaukee Chirago 67

HOW To Train Horses -A book mersshe who likes horses aboutd have. Free No ob garten P.m., address Reers Bernol of Horsemanahin, Dept. 545, Pleasant Hill, Chin in

RARR Degree Proc beliefen Bomostudy only, Midwestern Eible School, Broadripple, Indianapolis

USED Correspondence Courses (Mought and Bold) Money Back Churantes Gen. Dept & S. Lapened New Jersey

HIOH School Diploma at home Ltcensed teachers. Approved materials. Southern States Academy, Station E-13. Atlanta (la

ENGINERRING and Art Degrees earned through brane study Electric its Electricis. Mechanical, Civil Phraics Business Admin a ration I theral Acts When writing theory resume desired Pacific International Colores of Arts & Sciences primally a correspondence school Resident Casses also carried \$719 A canta Munica Boulevard Haynows \$8. California

SELL Slide Rules to college students? Hoffman, 662-8, Passale, New Jersey

LEARN Civil and criminal investigation at home Earn steady good pay institute Apputed Science, 1920 Sunnyesde, Dept 13C Chicago et L. a sis

UNED Correspondence Courses and Books sold and rented Money back giaranter Cataing free (Courses Bought ) Lee Mountain Pieceb Aichama

Tours free copy of World's higgest sales proved. Weaver School of Real Estate, and the tells you bot and where to 30.8R Grand Kansas Cit Mo.

STUDY for Durtor's Degree of Pavelole ogy Metaph airs and Direct Critical and Direct County of Direct Metaph airs Dept P 8 3811 North Liberals, Indianapous 5, Ind.

COMPLETE Your Bigh School at home in space time with 62 war-old achord. Trate furtished No lasers Diploma Information book et free American School, Dept ECes, Drezel at leth, Chicago 27, Julinois

WANT a Direct Joh? Wigher par? Advancement? We can help you que ify! Complete Direct Tractor and Heavy Equipment and Cumm to Direct Engine Shop-method home-teating courses available Write today Interview Training Service, Dept. B-2, Portland 12 Oct.

FREE I.Q. Test and information Know | 53 ADVERTISING AGENCIES. your shillties. Capitalize on your own su-perior talents. Write Associated Institute, Box 6, Manhattan Beach 2, California

BIG Money-Operate own Fix-it Shop Bervice household appliances motors movers, saws, akates, etc. Free So. & Christy Tindes School, A-8601, 3216 Lawrence, Chicago 25.

PROFITABLE welding trading evaluable Hobert Trade School, Box P-893 Troy, Ohio, GI approved. Pinest equipment in U.S.A. Reasonable prices Request

MEN, 17 to 45. Immediate Training as Jet Industry Specialists. We train you at home for Turbo Jet, Turbo Prop. Gas Turbine Engine Specialist Careers For Highs. tion 8 stern Office Shop First Caree a ence unnecessary Informs ton Pres No. Obligation. Jet Engine Div Northwest Schotza. Dept J-4 11 East 41 St. New York 17 H Y

ATTEND Business School At Home! Save time and expense of attending causes. Prepare for set eternal causes in the land to be the for catalog Wa ne is the land 2528 Sheffield Deak a W-1 Chicago 16

LEARN Curron Book Relating with proven simplified methods Instruction book and causing of \$6 designs the call-build for profitable resale \$2.00 Cieve land Book Co. No. 1851 Cleveland One

MEN Learn Electropies no experience or higher education necessary (tail) as Electronic Technicians And Specialists The need for trained men is great in all fields . . manufacturing communications. broadcasting, radar, your own service shop and many others. Start framing now. No. I on wide p accenetal he press budget terms variable hits luministed Wite Dept. C-2. Electronics Division, Northwest Schools, 1221 N.W. 21st, Portland, Oregon

PHYSICAL Therapy and Massage. Home-Training, Practice privately or work with doctors and hospitals. Free Cotalogue National Institute. Box 4, 150 E. Ontario, Chicago, Illinois.

LEARN Real Estate Business Past. Unlim ted opportun es Economi a home-study course. Particulars Pres. Gazdon-Howard Institute, 322 Glover Building Eanass City 5, Missouri

#### CONTENTS

WIN contest money General Contest Bulletin gives hundreds of tips. Lists current contests, rules. Sample magazine 25c Ceneral Contests, 1406-A East 5th, Du-luth 12. Mannesota

#### DETECTIVES.

DETECTIVES-Work home-Travel, Expertence universary Defective Particulars free, Write Wagoner, P-125 West Sult New York 34

DEFECTIVE Training. Phillips Secret Service System 1917-C North Kenneth Chicago 29. Lit

Bedge Certificate Pulses Box 41191-0 Los Angross 41 California

#### LANGUAGE OUTFITS

411

LEARN world interlurguage endorsed by Unesco, Free lesson, Esperanta Now, Middicton. Wisconsin.

"ESPERANTO For Americana" recom-mended textbook 63 85. Esperanto Insti-tute, Box 1385, Milwaukee 1, Wisconsin.

BUSINESS SERVICE INFORMATION, NAME LISTS

LAWYER, Manuel Borja Vargas, Box 1305, Tijunia, Mexico

#### 83 AUTHORS SERVICE

WANT Your Book Published? Learn how tre publish advertise protecte distribute Many successes Pres buolist PS. Vantage 120 West 31 New York

FREE Writers Caralogue giving manu-script markets We-te Literary Agent Mend, \$15 Brondway, New York 18.

#### ATC., FOR ADVERTISERS

BUILD Your Business With "Direct Mail Advertising " Catalogs Booklets Circu-ars F ders Broch area ar e Mercury Advertising Printers, 265 Franklin Ave Brust, to S. W. Y.

#### CARTOONING SIGN PRINTING, CHALK TALKS

PAINT Becas- Master die cut on little let er par erus Comprete associarent 1 a 17 high prepaid 82 00 Eyeziy F-863 Newton, 20%

COURSE in high-paying commercial art. 35. Donald Hartung. Box 43. Easton, Pa

MOW To Make Money With Surple Cartisina -A book everyous who also to draw about have it as even to obligation Surply address Cartisistical Each ange Dept. 194 Pleasure Him Observation

#### TYPEWRITERS A OFFICE MACRINES.

I.B M Electric Typewriters 143 15, Con-nemial Distributors, Box II, Temple timestal ( ) ( a = t 4

## SUBBER STAMPS & OFFICE SUPPLIES

THREE Line, and inting pecket rubber stamp plantic case \$1, merca; case \$1.00 L. Waters F. O Box 162, St. Charles. L'urom

50r PER Line Per Inch. Write Maruell's 836 B detrain Tentieringe

S lines \$1.50, (Berlyt, Print or Old Et a high). Free Stock & Advertising Stamps Circulars, Type Chart. I Day Service Youngers Stamp Shop, Frinceton, June

PREE-Rubber Stamp Catalog Martins 1925 Major Daise Jefferson City, Missouri STAMP Pree, with 196 letterheads and 100 large envelopes at \$5.00 ASP, 415 A same Long Brack 12 Cambric a

## PRINTING PTC.

PREE Catalog Postpald printing, Rubber stamps, D M Press Schastopol, Calif ters \$3.95. Samples, Pioneer listend Park, New Y-505 Raned Let

OFFSET Printing 24 Plant Service 98 75-,000 8' cl2 3:0 30- -005 Ma tank Letter 300 West 62rd St. New York Life

DISTINCTIVE, Low-Cost Business Printing Catagog, Samples Free, Biggerstaff Printing, Box 1351, Chapel Hill. N C

BUSINESS Cards With Clamour Reasonable Samples Mention Susiness. Heav-

Enthusisers business car is 15 00 thing sand postpaid Free samples Quant Printing Beien, Hen Menton

BUSINESS Cards, reasonable, free sam-ples, R. Ford, 15 John Ave., Elmont, N. Y.

EXTTERMENDED Circula so ofe Price But Valadia 1 05 Sup h 2nd Phota 10 Page 100 6 , RNVELOPPS 100 5 of Let er heads printed, \$2.00. M. Portney, Box

167-RJ, Dillaburg 5. Pa 1 000 EMBOSSED Business Cords \$1 10 Postpa d Samples E.us. 5000 Highland view, Sylvania, Obio

1900 PERSONALIZED Name & Address labels in plantic case \$1 00. Free literature describing other personalized items Youngers, Princeton, Iowa.

COLORED Or White 6' vil offset 1 000 63 30 5 000-817 00 Past Also art from typing is out Promotion 385 PB Broadway New York City 11

PREE, 500 (lummed Same & Address Labels, with heast ful Two-tone plan is wift box. We send labels free even the you pay others \$ 00 for same size & at le Our reason? We L make new friends Mc I'm t but please emove Mr photoge & handling for each 500 Order today Deer-field Home, Deerfield Bidg, Palmdale CHAL

#### PRINTING OUTFITS, STEPPLES

PRINT, exchange hobby papers. American Amateur Press Association, 827 South Orleans, Tampa S. Florida.

DO your own printing Save money Simple rules We supply every bing Print for others good profit Raised printing like engrating too Ha e home shop. Details free Keisey Presses V-8. Meriden, Conn.

PRINTING Presses. Type, Supplies, Lists, 6c. Turnbaugh Service, Mechanics-burg, Pa

RUBBER Stamp Present Mydraulic Op-erated Electron v bested Stres 5'th', ft. 2" jori5" starting outfits supplies, Printing Presses, supplies Custom Manu-lacturing, 507 M. Jefferson, Springfield S.

MAKE Your Own self-moiding rubber, stamps and printing data Pleateubber, Argyle 2, Wisconstn

TYPE for Printers and Rubber Stamp Makers Largest selection in U.S. bend for hig free catalog Acme Type, 633 Pamouth Court Charge

TYPE rases supplies from manufac-turer Cataing K is Mc Kay Compary, 23.76 Telegraph Road, Detroit 41 Marhig på

#### PATENT ATTORNESS

INVENTORS Learn how to protect your invention. Unless the inventor is familiar a h patent multers he should engage a competer t registered patent attorner or competer t registered patent attorner or agent to represent him We are registered to payetice before the U.S. Farent Coming and presented to serve you in handling rose patent matters. "Patent Guide for the Inventor" containing detailed information concerning patent projection and procedure with "Record of Inventor" form will be forwarded to you upon request without objigation. Clarence A. quest without objigation Clarence A O Brien & Harvey Jacobson Registered Patent Attorner's 928 O District National Bu siting Washington D C

INVENTORS - Take these preliminary atron toward patent protection Sketch as d describe your invention. Sign, date and have this disclosure witnessed by two pers to whe arguers in your highling. Haye us make a pretiminary search am sig U.S. patents already granted for similar types of invention. We report on the probable patentability of your invention and recommend your further course of action. Write for our instructive booklet, "Patent Protection for Inventors" and Convenient evidence of Invention disclosure form. Victor J Evens & Cn., 541-J Merita Bunding, Washington 6, D C

INVENTION Record form free and "Palent Information Every Inventor Stinula Have." Carl Milier Registered Potent Attorney, Woodworth Building, New York

INVENTION & Cluide and Record of Invention free on request Frank B Led-remann 134 Nassau Street New York Carr

INVENTORS With of obsertion write for information explaining the steps you should lake to see to a Parent John Randolph, Registered Fatent Attorney, 306 Victor Bidg., Washington J. D. C.

INVENTORS Potent Information will tw sent on request. C A. Snew & Company, Registered Patent Attorners & 427 Snew Bundang Washington I D C

INVENTORS—If you believe that you have an invention, you should find out their to present a The firm of Mc Morrow, Berman & Davidson is qualified to take the necessary steps for you wend for copy of our Parent Bookset New to Protect Your Invention and Investion Record from No obtantion McMorror Berman & Davidson Registered Patent Attorneys, 143 H Victor Building Washington 1, D.C.

#### PURE ENVIRONMENT

INVESTORS, if you have an invention for said, paters ed of unpatented, write fo-stitute of American Inventors, Dept. 36A, 445-F St., M W., Washington 4, D. C

INVENTORS Dest sen your seventing Patented or Unpatroted until you receive our offer write Coughl, Box 298-C, Mar-Son, Ohie.

Wit have the markets if you have the ideas. Harvey Engineering, Cambridge 1, Maryland

PATENT Searches 86.40. 46-hour service. Free Insention Protection forms We to Raymond I Smith Parent Searcher 629 Speraton Building Washington 5 D C

PATENT Searches including supies of nearest patents as the Regul s armaded within 48 hours More than to regularized patent attorneys use my service For First Invention projection forms Wills Mashaugton 4 D. C.

PATRICT Searches \$6 08, 46 hour airmail service. Invention Protection forms free Write Patent Engineering Service. 711 14th Street N W., Washington 5, D C

FREE-"Vital Information Every Inventor Needs Before Sening Invention." Brown Box 349. New York 6. N. Y.

DIVENTIONS wanted now by my Manufacturer Chents, Patented, Unpatented Write Cilbert Adams, Patent Broker, 20-B Wall Street, Pinancial District, New York City

INVENTORS—If you believe that you have an invention you stoud find out how to protect it. The firm of M Morrow Berman a Day down in quarted to take the permanent steps for you head for copy of our Patent Bushet. How to Protect Your Intention and Inve ton Record form No obagation McMorrow, Berman & Day,doon Region and Partin Atlantica 142-(2 Versor Bushing Washington I. D.C.

INVENTORS—Send for free Patent Information bink and Inventor's Registered Patent Attorney, Associate Examiner, Patent Office 1923-1929, Patent Attorney & Advisor, Many Department 1910 1947 Gustava Miller, 49-PSJ Warner Bunding Washington 4, D. C.

INVENTORS Learn how to protect your invention. Patent coulds to be, ing detailed information concerning palent protection and procedure together with "Record of invention" form will be forwarded upon request—without obligation. We are registered to practice before the U.S. Patent Office and prepared to serve you in handing your patent matters. Clarence A.O. Brien & Harvey Jacobson, Registered Patent Attorneys. StA-O. District Mational Building Washington, D. C.

prventors without obligation write for information explaining the steps you should take to secure a Fatent on your invention. John Randosph, Registered Patent Attorney, 866 Victor Bldg., Washington 1, D C

"INVENTOR'S Cuple" sent free Prenk B. Ledermann, 154 Namest Street, New York 18 N Y

INVENTION Record form free and "Patent Information Every Inventor Should Have" Carl Miller, Registered Patent Atturney Wood ofth Building New York

inventors—This firm is registered to practice before the United States Patent Office and available to asset ou in the preparation and presentation of your patent application. "Patent Protection for Inventors" booklet con a ring de a sed in formation and stema to take lowe of satent procession and stema to take lowe of satent procession but of J. Francis & Co. 142-J. Mer'an Buildarg Washington & D. C.

INVESTIGATE Have a se good patentiable bleas? Write Mr. Motaler, 130 West 62nd New York.

INVENTORS! Consider our offer first before selling or E envir voter transition on a cash or royalty basis. Patented. Unpatented. Inventions on Demand. The Wall Street. New York 5 M. Y.

HIGHEST Can Recad to Juveniors Raving Good Ideas Write, Inventors Creative Service, 354 South Spring, Los Angers 11 Calif

PATENTS or Money for your Ideas Buyers waiting, You must have Jack Pot Pay Off Lat. save, double Princet in Information 12 00. A. B. Research, 1966 W. Mais, Chicago 40, Ill.

#### 61 INVESTIGNS WANTED

INVENTORS Hundreds of me after arers have requested our assistance in locating marketable new products. Complete
inform. I'm free. Institute of American
Inventor. Dept. 30C 635-P Street. N W,
Wastington 4 D C

INVENTIONS wanted Patented unpatented. Tremendous Mahufacturers have Global Marketing Service, 2420 Tith. Oakland 5, Cauf MILITARY Investions Bended Write Box 4913 Section 338-E, Washington. D C for Free list.

INVENTORS Don't sell your invention Parented or Union ented union your votes our offer write Cowgell. Box 200 D. Mar-less Otton

ARE you interested in offers from reliable manufacturers for your invention? Patented unpatented Marvey Engineering Cambridge, Mary and

INVENTIONS Wanted "Patented -Patent Pending" 28 Years experience Promoting Invertions Mational Service Screen 3122 Maramon, St. Louis 18 Managari

FREE-"Vital Information Every Inventor Needs Before Selling Invention." Brown, Box 349. New York 8, M Y

1NVENTORS Get The Seat Offer First?
Peters ed or unpatented. Write Carl Sommer Director Industrial Intention dates
1:16 B Sylvania Ave. Toledo U. Ohio.

INVICATIONS wanted now by my Manu-Inclurer Chents Patented Unpaters of Wall Street Pinancial District. New York Curs

IF your invention is adaptable to promoting we will contract for so ing on cash or rotally Free bookiet natures rotally rates requirements Kessier Corporation. It W. Fremont Ohio.

INVENTORS Come der our offer first before selling or bestieling jour invention on a cash or rotality basis Patented Unpatented Inventions on Demand, 19 Wall birect New York 5 20 T

PitFE Last Needed Inventions Protection Form Inventors Sales & Engineering Sureau Dept. 180 S. Son 1911, Washington & D. C.

INVENTIONS Warted for Manufacturers Pres Details Write-Allen Dept Ditta Davis Bidg., Dullas & Treas

#### MANUFACTURING

HOME Manufacture From Plastics Detalls. From Products. Box 437, Worner Robins, Georgia

MANUPACTURER Pishing Luces Pinstle none better 20 Montels Pent tes Pres circular Quaker 3514-35 N Laurence Ph. a 46 Pa

#### 64 MODELS, MODEL ST PPLIES

POWER Drives Handbrok 16 pages silvatrating many types motor drives for model auton house, dispuse luin ables of Ms. 25 cents cash returnable first order \$3.00 or more W son a of Coverant Drive PS, 626 Lahands H W, Chrysland 12.

SHIP Models Most complete line in New England. Kits. Strings, plans, books tools, engines, motors Lituarrated catalog the James Blue and Co. Inc. Days PS H3 Avanue Avenue Boston to, Massachusetta.

SiffP and yarht model fittings blue prints Send lite for Literated catalog Fin acting hundreds of stems A J. Picher 1962-2 Szowah Ave Hoyal Oak Michigan.

SCALE model materials for building model homes and architectural buildings of any type. %" and %" scale, Send 23c for raining A&B Mistel Builders Deck 8 434 Denovati Road Kanasa City Kanasa

ST Steam Engine Castings Petrique Catalog 15c Ship Models Ltd 100 Summer Andorer Mass

SHIP Model Eits And Pittings' Clippers, Achooners, Frigates, Brigs, Plaque Models Plans Catalog And Book List the Model Shipmays Box 85, Regota New Jerset

LIQUID Rocket 75 ib. thrust 5' long Complete plans 27 00. Missile Research, S'alton 1 Prove. U'ah.

ROCKETS-Complete plans, 1 and 2 stage, %" to 3%" diameter. See ad page

POWER Models Coursel even gaseine and traction engines. Stings, metals Boiler water gauges. Comprehensive, 92 page catalog \$1.08. Charles Cols, Ventura Calif

ROCKET Supplies, Nossles, Cones. Tubra Specials Also Made Catalog 10c Sky Mfg Co., Mineral Point, Pa. a mome ceapteman

PREE Leathercraft Catalog Quality Kits Leathers Tools Handicrafters, Dept. 8. Bus 421 Montgood Ca forms

PREE Do B-Vourself Leathercraft Catains Tandy Lea her Company, Box 7st Not Port Worth Texas

LEARN Art Metaleraft and jeweit) making Complete inexpensive home training roune now atmosphe Special tools and materials furbiated. Write for free booket Internate Training Service, Dept 1-2. Forward 12. Oregon.

PAINT Sprayer 7 times faster than brushing Sensational offer? Free Folder Imsco. 1826 S. State, Chicago 16, Illinois

I'PREE'! Leathercraft catalog. Hundreds of new items. Write MacPherson Bros. Leather Company, Dept A. 730 Mission Bt., Ban Francisco J. Calif

Catalog—Ensity assembled kits; repair parts, fixtures, Shoplite, 5505 Franklin, Butley 10, New Jursey

WINDSWORKING and Cabinetmaking course for beginning and advanced home crait amon. Or by complete low-cost home training program as a shie Write for free brokert Interestate T a ning Service Dept. O. 2. Portland 13. Overon.

CYPRESS Enecs-For Lamps, arrangements, gifts, 10-16"-six asserted 55 75.
partiald, guaranteed Gippes s, DeLeon.

SQUARTER NOTTERS Make belts handbugs langards die seashes etc Spenal offer Beg ners book to a og and qually cord astrones 25c P. C. Sterwig to Dest ". P" is Henry St. Brook vo. I. New York

PREE. New Catalog 3458 artist-drawn patterns. Craftplans, 1323-B Wabsah, Chicago S.

EERP a supply of pents wond preservative on hand to pentert both old and new wood Send \$1.46 for one as less of Penter to Rot Stoppers. \$10 Killsoft. Bullsto S. New York

RIVE Dried Walnut Cherry Etc Hardwords Books Boords And Squares M dand Lamber Company P O Box 163, Satannah Mo

#### DO IT TOURSLLY

NOT Water Instantly Every Paucet. Complete, Easy Instructions \$1.00. Am-

BUILD real Black Porest Cuckes Clock size 19x7%. Compare Do-it-Yourself fill with original Black Porest Woodcarving retuine parts numbered cuckes calmetery quarter hour, accurate time-keeper for years, 16 page diagram; instruction book handsome gift box packing Parcel Post pand from Black Porest, West Germany Ages a mate y 4 weeks parcel post time Increductery price 84 96 incredes packing Increductery price 84 96 incredes packing in the and pp Import duty collected on de yers to see app. 1x \$2.00 Send mained at test a bis certified these or many cole to Picture Edw D Mahan Philipping of 12 Pa Introducted are price enth Mov. 15, 1856, Regular price of 18 56 starts Nov. 16, 1856, Regular price of 18 56 starts Nov. 16, 1856, Regular price of 18 56 starts Nov. 16, 1856 (set Yours Now.

LIFETIME Welder From Junk Fain Riortric, R13, Pt. Worth 4, Texas

## WATCHES, ETC.

USED and new watches if up. Free List Southern Watches, 3-PS So, Walnah. Chicago 2

RIGHEST Cash For Old Gold, Jewelry Ond Treth Watches Diamonds, Silver-ware Spectacles Flatinum, Mercury Free Information. Rose Rafiners, Heyworth Bids Chago 2

PREE catalog. Costume jewelry parts Supplies. Reasonable prices. Past service to a 
NEW Chronograph wristwatch—stainless case 6-hr timing period Guaranteed \$12.00 P G. Liston, Box 682-a, Wooster Otto

#### TUBACCO A PIPES

REQUEST fine pipes catalog free Ho-

FOR THE HOME

FOAM rubber furniture cushions—Fac-tory seconds 50% discount. Pres catalog Perma-Poam, 300-A Mys Ave., Irvington. New Jersey

BURGLAR Alarm no electricity, locks partially raised windows, Allied Associates, Box 48, Dexter, Maine.

STORM Windows to 36" wide, low as \$2 96. Sourdy, attractive, durable, \$1 brings munsy saving details. J. P. Schroeder & Sons. Box 516, Wheeling, W. Va.

#### TO OF INTEREST TO WOMEN

MAKE 525 to \$35 weekly addressing en-velopes. Our instructions reveal how Glenway, Box 6548, Cleve,and L Obio.

DICESNES 16c Show 30 Men s main 66 to, transers \$1.20 Retter used their ing. Free Culman T approved 464 H Christopher Brooklyn 13 N Y

INTERIOR Descrition Approved to restricted home study training Fine and imposit for career No classes little and work hit fury about Population anarded Law tuision and parameter boulder Chicago School of little or Descrition and Diversey Flay Dept. 4530 Clurage 11

CUT-Type-Sew extra money in your space time With typewriter here to fine chitie or eciments ving can marm \$20 o \$30 a week at home For or alls which 25 in com to Stouwster, Box 337, Morris Plants New Jersey

\$200. MONTHLY Possible, Sewing Babiwear! No house selling Free Information Send name to Cuties, Warsaw 16, Indiana

#### TE POR BALK MISCRILLANEOUS

VITAMINS-85.00 Delivers three month supply of a reagest forme a others sent for 85 to Moderne, 800A Hormandy Manual Beach Plurids.

DIRECT From Scotland, Special Offer of Handwoven Harris Tweeds, made in the Scottish crefters own homes, at less than half price-10/- per yard (only \$1.40) Each length has been dried over a peat fre to preserve the famous Hairle odour Write air mail for free patterns Spe a. Bale Offer of all wood full wir Tarink Rugs in Royal Stewart Hams ton H beertacet Pracer at 6 Walters ared Back Watch and Mardonald shae greens Huchanne relies Dress Stewart cubite red and Macphersons throwns: For t and Marphenona throwns from t and to the first or being over Keduced to 47 ad each (84 65). Were 60 to 40 to Laden Pair late Yoke Lumber Jackets or tenfert in fauth and grav hackstoonder in hovely traditional designs a see M. In 42° bust price 52 ad each 57 35 42" bust price 52 ad each 67 33. Special states ar designs made to order Hurris Witte. Burks all woo, regetable dies sizes 2" in 12" foot less'h 22 6d 83 31 for three pairs Resy sleeved Harris Woo, and Mortregian pullovers or swesters, suitable for flahermen, hunters himber jacks, drivers mechanics, sizes 34° to 48° chest, price 87 4d (\$12.25) each. Otled wool, semi-waterproof and wear lot years Remit to be toon, theque dollar drafts American Express postal orders and I donar for postage and insurance on orders of up to 8 dollars, 2 dollars up to 20 donars. Money back guar-ar or Price Sal of Harris (weeds instans request Hebr dean Croftes Weavers lad pt P S Mair of Aird, Buthreuls, Outer Hebriden Brostand

TREMMOMETER- New Electrical -Ac-Curately Measures Remotely to 2000 St. at five different loca loca. Have at your five gerlips temperature of Anith ng Air liqside inside fruit also Humid ty. Free Brothurs Electra Trong Co., Dogt A. Box, 6111 San Diego & Colif

OUARANTEED uplift rupture suprorts 82 00 Black Pat also for sale Charles T Nummersley 1362 Ekin Ave. New Albahy frid

#### 78 WANTED TO BLY

QUICESILVER, peatinum, silver gold. Ores annived Mercury Terminal, Norwood Massachusetts

IMMEDIATE Cash For Doed Plating Equipment Send Description Equipment Division 1636 East Pirst, Les Angeles 31 California.

74 RAZOR BLADES, SHAVERS

PREE Sample New Double Single edge ranor hisdes (8-0, 60 quaranteed Jor-day a, 552 West O'Connor Lone, Ohio

#### TATTUOING 81 PPLIES

LEARN profitable, featinating Tattooing Illustrated Information \$100. Zeis, 728 B Leshe, Rockford, Illustra

#### GEIGER COUNTERS & TREAST RE PINDERS

TRANSISTOR Treasure Detectors, un-derma at desectors. Many models. Free to slop found for Elect match to. Dept. 1 2545 East Indian action. Phoenix A sons

MONEY for you to burned treasurecoins, gold, nilver can be found with touchet Transletorized Locators Five mid eli malud ng Underwater Landar priced from \$ 8 to Free itterature Authoritic broks at known treasures are able Goldak Company, 1548 West Glenoaks Blvd Glendale 1. California

METAL Locator Rits and Assembled Models from \$19.00 Tran into rd and Undermaine Models Available here Ca a hig Earthenic Applications Dept 4. Box 8. Artigion of Courts

Bristist Describer Worder Me al Pres Bristist Describer Properting Informa 1940 Uses E.c. Mu Age Box 143 Hotali Bat afford Bank Canada

THANS, STOR, ZED M Some uner which theres has reasoures gold a let etc. Eight. bright superior store deper table F on 878 56 Bass Terms Fred Cataon Finner Research Dept C 2 Pain A to California

CHILD Stiver Detectors Geiger Crusters. Violand for thingster, etc. Best associated foundation but that it is proved the contract of t 3528 Vinerand Ave., Dept. 40. Borth Builtword California.

PORTABLE Geiger Counter to Debers Shipped. Details Free Copen, Rairdwood Lane Prestwood. Bucks. England.

THYABURF Section Handbook Tie Locators Hung. Lil Kansas, Atchison

#### WATCH REPAIRING

WATCH and clock repairing broke Free catalog Both American 2230 BH Miss wanter. Chicago 47, Illinois

WATCHMAKERS' Tools Materials, Sup-Chicago W D thesa Jewesers plies. Watches. Catalog. Gales, Box 1008.

WATCHMARRIES Journey Lapit-Series Catego de Brinsh, 89,2 Venue Lague Cu ver Cha California guaran eed Lan s 17 South Center

#### MISSIFFIANKOUS

El PCTRONIC Bloop Induces, Complete-ty harmess Free literature Cardiner Dectronus Co Dept 26, 2545 East Indian School Passers Arteons.

builded to help you wan at races, polter, erais must are game, Catalog free, Turi Book Shop 37 1-2. Inglewood, California.

HE MAROKANLE flushlights \$3.96, Black Farest cach his \$3.05. Gamer, 1105 W. Matterry 5" Rustomo, Indiana.

ANK you Moody-Brut' Send \$1.00 To

212 PAGE Catalog 62 00 Laborators Mater ale 73.8 Vincerhee Chicago Idinois

SHOW Cone Machines At, Prices And Stem Special For Grecory Stores, But 1803 Da las, Texas

RECEIVE-Magazine Samples Mails Catalogues Bargains Prom Everywhere Get Listed Sic. Rorick's, Cincinnati M. Otile

PLORIDA Listings, Business, farm op-portunities 100-61 00, Box 2731, Jacksonville 3, Plorida.

BARGAIN 12 ball pero 81 00 Pres gail W () |, 00 20 14 Ave Brooklin 27 N

POWERFUL low homemade windmails Improved mimeurraph Simplified east algebra Write Lietaba, 1-6121 Orchard. Den/born, Michigan

THE Original Maste Thread America fabric mender for both from and tramen Send 20 00 for 2 on buttie No COD's Money back guaran re Units Products Company Valatio, H. V

CONCENTRATED Powder Guaranteed To Caso Without Rubbing Brain S. 147 Gold. Copper Like New \$1.00 Postpaid Robert Landahl, 1123-14 Street, Rockford,

HEW OF Dig Culture Safe Vault Pray fure Surgiar Asarm Concumation Lock Cash Drawer She I Real for cash papers, see On y 84.25 Portpaid (Mist Betta-Free Pilder Mass the Sales Co., LM-P Vancerbut Ave. Brushop 3, N. Y.

CESSPOOLS, septic tanks, all clogged drains cleaned, deodorized by new enzyme product flavor ancient pumping day ig etc. Harmone to plant my pris or perpie Sm, b Bak th ough whet Ha may be supply on y 87 by Mand no where and I SA Electric Sewer Cleaning Co., Allston 34. Mass.

HERE Doctor Book. Particulars from Dixie Herbalist, Quicksburg 8, Virginia

#### 79A WESTERN MERCHANDISE

HANDMADE Western Boots, Pres Calalog Hall Boots, Box 246, Ysieta, Taxaa

#### PERSONAL

MEXICAN Logal Matters, A. Espaja, Box 324, Rermonille, Sonors, Mexico

BORROW 650 to \$400 By Mail Quick, East, Princie No Co-bigue a Repair to 24 small month a partier a but the amount you was write a day to Dist Princip Co., 6 6 Kapatrick Bulg Dept H-1 Constant.

REMARKS 25c Part ording 43 60 month. Reddie Bun be. Detrent 2. Mier utnie

ENOW the real truth about mind sickness prisons, tr Backed by \$25,000 signed \$ state or 20th Consury Publications, 21's A Topongo Conson Bird. Topongo, Curatuffian.

WASHINGTON, D. C. Maring address. Monthly \$4.00. Letters remailed 236 Worden of Capitol E. I. Bir e. J. 1. 746 as h. Brevet, N. W. Washington, S. D. C.

Apr. 78 Cd Justes, Ch h Mexico.

RULE Others with your Thoughts." teps by there is - stamp to Content hee he municipalde Chicago en

LOANS By Mail \$50 To \$800 For Any putprise Emphased then and a onen el atfor free loan application, American Loan Plan City National Bids, Lingt PR 66, Omaha 2 Nebraska

HANDWRITTHO Anal on Your chargeter trula revented, \$1 00. Jaymors, \$10. Niagara Pallo, M. Y

REMAILS, Los Angeles 25c Porwarding 63 06 month. Sylbert, Box 4325, M Ingletrund Caufortina

NIAGARA Falls remails 25c. Fast, confidential receiving and forwarding, \$3 monthly, Jaymore, \$16 Misgara Palls, New

SECRET Ma I Receiving Forwarding System Hedgesth, Box 630, Albambra M. California

FLORIDA Remails 25c, Monthly 33 08. Al Ontlia, Box 7216, Jacksonville 18.

BORROW By Mail, \$100-\$600, Anywhere, Air Mail Service, Puntal Finance, 200 Keeling Bullding, Dept. 16P, Comaha 3, Hebraska.

X-RAY Eyes." Adults, Entire Course. Sunnyaide, Chicago 48

CARADA, Airmeil 35c, Regular 25c, Monthly 52 8s. Classifieds 81 96. Postcarde 3sc PT Bervice, P.O. Box 636, Montreal 1, Que

MAZL Received, Forwarded, Esc letter-83 66 month, Lloyd Mother, 291; M. Plagter, West Paku Beach, Plotida

CONFIDENTIAL remailing Service 16c, monthly \$3.00. Hill's Export Import Service. Box 805-PS. Plint 1. Michigan

SUPER memory overnight! Success guaranteed! Bljog. Box 1727-V, Mollywood

VITAMINS containing 36 Healthful Matrien's Free Sample Stewart, 1626-VF Washington, New York 56, New York

## You Do So Have to Wax It

Elbow grease is still needed on a 1959 car with so-called "super

finish." You have to clean and wax it, if you want to keep it looking its best. This word comes from what admittedly is not a disinterested source, Dr. J. V. Steinle, research and development vice president of Johnson's Wax. But he

backs it up with some convincing facts.

Dr. Steinle doesn't knock the new enamels and acrylic lacquers. He acknowledges that they are greatly superior to old finishes, don't chalk and fade nearly as much. "However, this is not to say they do not chalk or fade at all." He said that tests proved waxing improved gloss of new finishes, belped retain that gloss in like-new condition.

The snapper, Dr. Steinle reports, is that owner's manuals in many new cars still recommend periodic waxing—in di-

rect contradiction to no-waxing-needed ad claims!

You'll be hearing about Darts, new Plymouth-sized Dodges. Scheduled to appear in that Chrysler division's 1960 lineup, there'll be three series: Seneca, Pioneer and Phoenix. All will have 118-inch wheelbases (current Dodges have 122-

inch wheelbases). Prices: in Plymouth-Ford-Chevy range. Darts will be sold by Dodge dealers only, replacing Plymouths—which will no longer be available through Dodge

salesrooms.

Both V-8 and six-cylinder engines will be offered in Darts. The six will probably be a modified version of the in-line engine with pushrod-operated overhead valves designed for Chrysler's compact car, the Valiant. Other mechanical details will be similar to larger Dodges, to be offered in just two series in comparison to the three now available.

A clue to prices that can be expected on Big Three compact cars:

A very unofficial Ford source indicates that the company is shooting for a suggested list price for Falcons of \$2,047 for two-doors, \$2,117 for four-doors. What happens in steel negotiations could change this, but it shows the area the

companies are thinking of

The word on Falcon performance is that engineers have been shooting for an acceleration target of 19 seconds from a standstill to 60 m.p.h. This is just a shade slower than current Big Three sixes with automatic transmissions.

The switch to unitized construction will enable Chrysler to get back close to its long cherished "chair-high" seat concept in 1960 models, while retaining low silhouettes.

Since Forward Look cars appeared, the corporation has been stung by complaints about too-low seats from custom-

[Continued on page 196]

# TIRE FACTS THAT CAN SAVE YOUR LIFE

## ARMSTRONG TREAD INVENTION MAKES TIRES SAFER!

"Safety Discs" Make Tread Grip to Stop Deadly Skids - As No Other Tire Can

When you brake, so much pressure is put
on your tires that the tread design can be
squeezed to a smooth, slippery surface!
This can't happen with Armstrong Tires,
because hundreds of "Ounce of
Prevention" Safety Discs, molded
between the tread ribs, hold the
tread open, always ready
to grip the road.

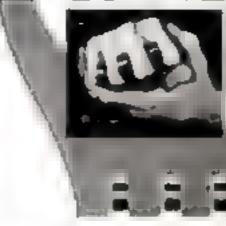
#### SEE THE DIFFERENCE

Fists show how Safety Discs keep tread open without discs, tread can squeeze shut



## Experts Find: SKIDS NOW MOST COMMON HAZARD

Higher speeds, heavier cars are blamed for making skids the most frequent factor in accidents, and by far the commonest tire failure. Ride safer on Armstrong Miracle Safety Disc Tiles - see your Armstrong Dealer, fisted in the Yellow Pages.



#### ARMSTRONG TIRES

Like fingers of fist above, trend CAN'T be squeezed shut. No matter how hard you brake, Safety Discs hold tread ribs apart, so edges can "late" the road.



#### **ORDINARY TIRES**

Without discs, trend can easily squeeze shut, like fist above. Gripping edges are pushed together Even brand new tires can go smooth like this . . . and you skid!

ARMSTRONG RUBBER COMPANY
Home Office, West Haven, Connecticut

## You can't miss with Lucky Strike.

You're sure of its tobacco—fine, mild, golden-rich.
You're sure of its taste—full, fresh, unforgettable.



Get the genuine article ...



# Get the honest taste of a LUCKY STRIKE

# How to Drive and Stay Alive



## A top sports-car race driver gives you his 14 commandments for survival

BY E. D. FALES JR.

TOW does a racing driver—or anyone else—stay alive on today's car-smashing highways? I put the question to John Fitch, one of the world's top sports-car drivers.

It's an important question for two reasons: 1) the chances that you will crack up your car this year are incredibly high: 1 in 8, according to the National Safety Council; 2) in spite of these insane odds, Fitch, in more than 20 years of driving, has never had a crash on a public highway. Obviously, he has something that the average driver doesn't. Sure, Fitch has crashed in races. He's had his "bumps."

Once in France he was tossed off a curve at 120 m.p.h. The police said his Cunningham rolled over at least a dozen times, and bounced end over end three times. They ran to pick up Fitch in little pieces and found—no Fitch. Far away they saw a long-legged guy hotfooting it through the fields as fast as the wind.

I spent some time riding with Fitch on New England roads, noting how his driving differed. Here's what I learned. Fitch has 14 commandments that keep him safe:



Race driver John Fitch and author Ed Fales check their route.

Follow these rules to safer driving



## "Taking a trip today is like crossing



"When I'm racing," Fitch said, "one part of my mind is always appraising the sides of the track-both sides, I've trained myself to do this without conscious effort. Most race drivers do. We're always looking for 'escapes'. I do this on the highway, too. I've hit the ditch several times, and that's why I am alive."

The average fellow, John told me, never thinks of running off the road.



All his effort is tuned toward staying on it. That's why we have those terrible early-morning head-on collisions that wipe out whole families. A drunk comes down the wrong side—and the other fellow doesn't take off into a field.

"A motorist should practice this in his mind," Fitch said, as we left his home in Lime Rock, Conn., and headed for Albany, N. Y. "As you drive, train your eyes to see every 'sudden-escape' route into fields, up hillsides, across ditches, into barnyards.

"Alert your mind to 'sudden stoppers'. These are the killers: concrete abutments, deep ditches that roll you over, power poles, rock ledges—and any trees over eight inches thick. (I'd like to stress the absolute necessity of avoiding trees of this size.) Keep practicing subconsciously how you'll miss these stoppers and swerve up a bank, between trees, over shallow ditches. Then when a crash comes heading your way, you can hope to run away from it."

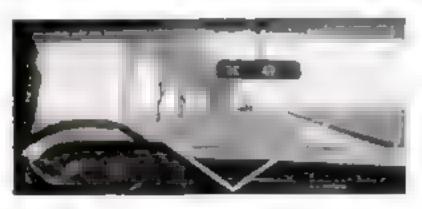


## Adjust speed for your "escape cone"

Most good racing circuits have built-in "escapes"—emergency run-out areas. When a driver approaches a turn that has

no escape, he guards against the slightest mistake. Usually this means reducing speed. Motorists, says Fitch, should follow the same policy.

Let's say you're doing a legal 60 on a fine road. No houses. Open fields on



both sides. You are now driving in what might be called a wide "escape cone."

Then a farmhouse appears on the right. The cone narrows, "I'd knock off five m.p.h.," said Fitch. Now there's a second farmhouse on the right, barn on the left.



The cone becomes quite narrow. Take off another five m p.h. Anything-a dog, a child, a tractor—can suddenly puncture your cone of safety. You are in danger above 50 m.p.h.

If a car comes toward you in that parrow cone, the cone is squeezed down again. "I'd probably cut my speed to 45. a full 15 m.p.h. under the limit," said Fitch.



## Use your headlights in the daytime

Racing in broad daylight, in 1955, in Italy's dangerous Mille Miglia, Fitch was annoyed. Three times, at pit stops, committee members handed him notes saying: "Your headlights are on."

"I know they're on," Fitch told them. "I put them on-because I want to be seen."

To survive on today's roads, Fitch says you need to be seen, too. You need all the attention you can get. We en-

## a battlefield-they're shooting at you"

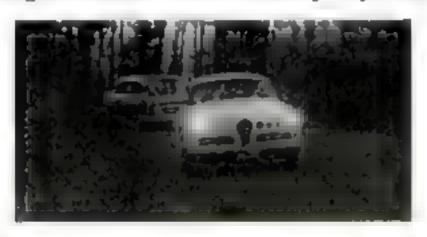
tered New York State on twisting, hilly Route 199. It was a cloudy day and Fitch, wheeling my car along, switched on the lights. We kept meeting cars that crowded us on tight turns, and sometimes their wheels got on our side of the center line.

Not so after we began using lights. The first car we met whipped toward us a good 18 inches on our side of the road. As our headlights flashed around the turn he hauled his car back where it belonged. This happened several times, Obviously, headlights get you faster split-second recognition on turns—at least on cloudy days.

"Have you ever noticed," Fitch said, "that even some railroad trains now use headlights all day long? They want to be seen sooner by motorists using the grade crossings."

Fitch was one of the first racing drivers to use headlights. Today many put their lights on during a race.

Fitch doesn't recommend headlights in bright sunshine. But on cloudy days and



on twisting roads, they add a safety element. The car that sees you only a splitsecond faster is much less apt to clobber you.

Over the years, passing millions of cars, you're improving your chances of survival. Headlights, too, will get even a drunk's attention sooner!



## Know how to rub off speed

"In racing," said Fitch, "I think in terms of energy absorption if a crash looms," Fitch and I had been discussing this when a curious thing happened. We heard a crash like thunder, but with a metallic ring. It startled us.

In a car two blocks away, a little boy had fallen asleep in his mother's Pontiac. Trying to keep him from falling off the seat the mother veered off the road. The car headed straight for a "sudden stopper"—a deadly concrete abutment. But first the car hit a row of small posts.



These bent in the ground, drinking up energy and actually boosting the car two feet in the air—which drank up still more energy. "A perfect example of energy absorption," said Fitch. The young mother and son climbed out safely. They didn't know how lucky they were. If the car had hit the abutment squarely, they might have been killed.

"A driver," said Fitch, "should always be looking for small trees or posts, earth banks and the like, on which he can rub off speed if something goes wrong. One man I know laid his station wagon on its side in a snow-filled ditch and rubbed his speed down when he skidded from a road. If he hadn't done this he would have hit a concrete culvert—and might have been killed. Parked cars also can be used to rub speed off if your brakes should ever fail on a steep hill in town But be sure to rub them; don't hit them solid."

## 5

## Adjust speed for lane width



I noted that Fitch almost always changed his driving speed when the effective road width changed.

Near Sheffield, Mass., Route U.S. 7 is built of two parallel 10-foot wide

concrete slabs. Suddenly we came to a spot where the slabs narrowed to nine feet. Fitch chopped off five m.p.h.

"Many drivers," he said, "hold the same speed regardless of slab. I drive faster on a wide slab, slower on a narrow one. The narrow one crowds you closer to the other fellow. You're often passing him, inches away, at a combined speed of 120 m.p.h. No driver is so good that this can be safe."

I noted too that Fitch dropped his speed on a crowned road, increased it on a flat one. "Less stability on a sloping slab," he explained. "In racing, I am cautious if my car feels the least bit unstable. I carry this over into my highway driving, too."



## Pull off the road for an emergency fix

When something goes wrong that forces you to stop on a race track, says Fitch, the first rule is: "Clear your car!" This means: Get it off the road. It means get



it so far off that no other car can possibly

hit it—even in a spin out.

"This," said Fitch, "is something motorists haven't even begun to learn. Some still stop right in the lane to fix a tire. Others pull off, but only partly. A few pull all the way off—and then kneel down with their bottoms out in the road. A racing driver knows that getting that close to traffic is suicide.

"Clear your car even if you have to drive 200 yards on a flat tire to find a turnoff. This will ruin your tire, but go ahead and ruin it. It's better that way. Anything that stope on a road today is

apt to get hit."



## Use a longer radius on turns

In a race, Fitch enters a turn wide, cuts it fine at the apex, and finishes wide.

I noticed he does this on the highway, as well.

"Gives you stability," he said. "The



average driver tries to stay to the center of his lane all the way around. I hug the edge of the lane at the middle of the turn." This flattens the radius, making it easier. (The driver who does this on a *left* turn should be careful, naturally, not to get too close to the center line.)

Fitch wishes that some drivers would get rid of the idea that full throttle can pull you out of any turn you've hit too fast. This notion, he feels, has caused

many accidents.

"Ninety-nine times out of 100," he said, "the driver ends up turning a minor embarrassment into a disaster. While I don't subscribe to violent braking on a turn, gentle braking will cut speed without throwing you into the ditch. If I ever did find myself sliding wildly into a turn, with only a thread of control remaining, I wouldn't brake for fear of loeing an iota of side traction. And I certainly wouldn't accelerate either, for the same reason."



#### Always keep a sharp rear guard



Racing, Fitch almost gets cross-eyed keeping one eye on the track and one on the mirror. If mirrors were out he'd be changing them at every pit stop.

"You can't take your eyes off those boys behind you for a single minute," he said. "In a race they're charging down on you at 100 to 170 m.p.h. On a highway, they're barreling toward you at 50

to 70. No motorist should ever forget this."

Fitch rides his mirror every inch of the way. At night his rear guard is doubled. He goes on a sort of alert whenever headlights seem to be overtaking him too fast. This might be just a fellow citizen going somewhere in a hurry. But it could be a wild-running drunk.



## Lay well back before you pass

I noticed that Fitch, unlike many drivers, never creeps close to the car ahead before passing. He usually begins his passes 50 or 75 feet back, "On the highway I ease out early for several rea-



sons," he said, "I want to clear my view before I begin the pass. I want to be able to see a long way ahead. And I want to be able to run up my momentum so I get

the pass over with fast.

"The reckless or dreamy fellow who shaves your rear bumper pulling out to pass you is going to have to gun his motor hard in order to get ahead. This sudden gunning throws his car off balance and he loses stability. If he has to cut back sharply, brother, you're both in a jam.

"I have actually seen several of the higher-powered American cars go completely out of control during full-throttle passing. The combination of light-loaded rear wheels, the automatic selection of the optimum gear ratio, and powering out to pass has suddenly broken traction,

and sent the car sliding."



## Hold down your speed when passing

Here's where John, on a highway, departs from his racing routine. On a track doing 140 in a Ferrari, he may pass an MG doing 100—with a 40-mile passing differential. That's race-track driving.

"But on the road," he said, "I always cut speed to hold my passing differential to 10 m.p.h. If the lad ahead is buzzing along at 40, I never pass him at over 50

"There are two reasons: 1) a driver ahead on a race track is fairly predictable, but on a road he's as unpredictable as a psychopathic cat; 2) if I should happen to bump him, I'm hitting him at only 10 m.p.h. But if I'm doing 60 when I bump him, that's like hitting a stone wall at 20 m.p.h."



## Be alert for the "cone of blindness"

Back in Connecticut, we followed a truck on Route 44. Another car was directly behind the truck, hanging on to his rear bumper.

Laying 200 feet back we saw a car coming toward us. The fellow behind the truck couldn't see it, pulled out, and

nearly cracked up.

"His entire driving vision is blocked," John said. "He's driving into a wide



'cone of blindness.' Back here where we are, the cone is very narrow. I try to stay as far behind another vehicle as I



can—so that the cone of my vision that he blocks off is very small."

[Continued on page 188]

## Russian Propaganda Twists

Last August, Popular Science ran this news item—just as it appears here



Buffetproof "robot." Put a mun in this goggle-cycl econce-fiction suit, and he can walk into a shotpure blast and barely feel it it a fiber-glass and plastic, rusists bullets like quarter-inch steel. Ports open for defense wangoon, vision is through bulletproof glass and "eyes" are spotlights. Independent Engineering makes the suits for Detroit police.



SOUPEVATERABLE AMERICANS

County interested it increases of the party 
Andrews with the second state of the second 
per in the personal distance of the personal property of the personal perso

me openinary system.

Dyna yapp or cytopool, a
facility is hippostated by a
facility is not a
facility in the facility of
facility is not a
facility in the facility of
facility is not a
facility in the facility of
facilities in the facilities of
facilities of
facilities of
facilities of
facilities of
facilities of
facilities of
facilities of
facilities of
facilities of
facilities of
facilities of
facilities of
facilities of
facilities of
facilities of
facilities of
facilities of
facilities of
facilities of
facilities of
facilities of
facilities of
facilities of
facilities of
facilities of
facilities of
facilities of
facilities of
facilities of
facilities of
facilities of
facilities of
facilities of
facilities of
facilities of
facilities of
facilities of
facilities of
facilities of
facilities of
facilities of
facilities of
facilities of
facilities of
facilities of
facilities of
facilities of
facilities of
facilities of
facilities of
facilities of
facilities of
facilities of
facilities of
facilities of
facilities of
facilities of
facilities of
facilities of
facilities of
facilities of
facilities of
facilities of
facilities of
facilities of
facilities of
facilities of
facilities of
facilities of
facilities of
facilities of
facilities of
facilities of
facilities of
facilities of
facilities of
facilities of
facilities of
facilities of
facilities of
facilities

He many transport of the control of



prompt great areas department of the control of the



A Russian newspaper
lifted the photos
—without permission—
and printed its own story



MECHANICAL MOLE. Concentric rings at the end of this tunnel were made by teeth tone being welded above right on the revolving 29½-foot head of the machine on the facing page. Rock is bored by tungsten carbide bits on a rotary head of hard-faced steel alloy. It is removed by con-

## Popular Science News Item

A RECENT issue of the Russian newspaper Promyshlenno Ekonomicheskaya Gazeta (Industrial Economic Gazette) pirated the pictures from a PS news item, and accompanied them with a wildly distorted story. Translation, by the Slavic Scientific and Technical Library of Boulder, Col., follows:

#### Resourceful Gentlemen

Among the illustrations in the American magazine "Popular Science," two photographs under the heading "Robot Is Bullet-proof" attract attention.

What is the significance of what one sees

portrayed in these pictures?

A little explanation. Along with other new materials, modern technology has created a remarkable kind of laminated plastics—polyester glass laminates, which have wonderful qualities. This material is tougher than steel and lighter than aluminum. It has high sound absorption and permits up to 85 percent of the light to pass through. Water, salt solutions, gasoline and oil have no effect upon it, Everyone who becomes familiar with this material will say: how many wonderful things which would make life easier and more beautiful could be produced from it!

But a different idea flashed into the minds of gentlemen from the American firm "Independent Engineering"; wouldn't it be possible to use the laminates in such a way that one might himself remain alive while killing

other people?

And here is the result: the firm, in a move toward meeting the ardent desires of gang-

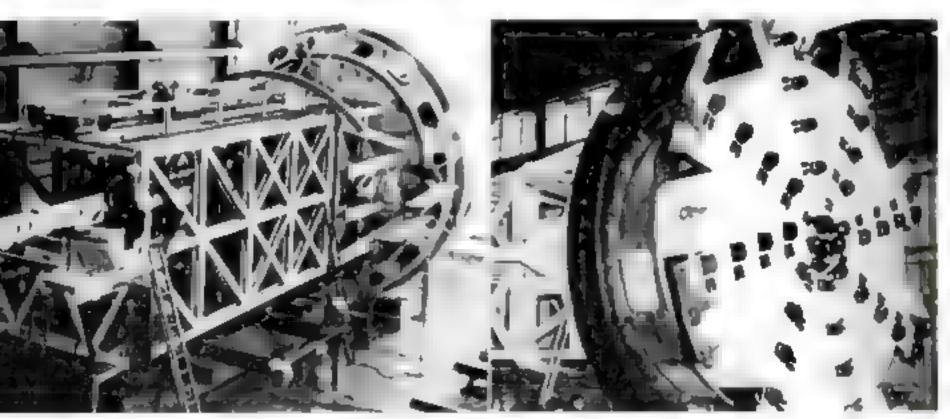
sters, Ku Klux Klan members and gendarmes, has developed the manufacture of polyester glass suits which cannot be penetrated by bullets.

There is still no information on how many orders have been received from the successors to Al Capone and from the "American Legion." But "Popular Science" reports that a contract has already been signed with the Detroit police. The "Independent Engineering" firm will make puncture-proof suits for them. Soon the Detroit police spies will be able to attack workers' meetings and Negro homes with less risk of being hit back.

Shown in the photograph at left is a man trying on the tailored product of the "Independent Engineering" firm. At right the suit is shown being worn. It is possible to shoot from the openings in the suit located at belt level. In demonstrating the quality of this original attire, one gentleman is trying to riddle the other with bullets. Marks made by the impact of the bullets can be seen clearly on the protective suit. After more than 10 shots the "gallant fellow" still stands on his feet as if nothing had happened,

Enlightened jailers and administrative clerks are always attracted to technical innovations. They have replaced the crude, unsystematic gallows with the elegant, high-voltage, electric chair. They have equipped the doors to Sing-Sing prison with photocells. They have provided police spies, who are sent secretly to workers' meetings and gatherings, with tiny radio transmitters and sound recorders which can be put into a coat pocket.

So you see there is really nothing out of the ordinary in the innovatory research of the "Independent Engineering" firm.



veyors housed in the frame. The device, powered by two 400-hp, motors, is pushed forward by hydraulic jacks on hinged side arms. Digging water-diversion and power tunnels at the Oahe Dam project in South Dakota, it has shattered and burrowed into shale at 12 feet an hour



## The Awesome Miracle of

Destructive but essential,

#### By Ira Wolfert

HEN you see lightning, it has already missed you. When you hear thunder, relax; the show is over. The noise is just the audience rush-

ing for the exits.

One of the great figures in thunderstorm exploration, the late Dr. Karl B. McEachron, used to reassure nervous laymen by telling them these facts—all scientifically true. Lightning moves about 30,000 times as fast as a bullet. If a big stroke were to hit you, you'd never know it. In the meantime, enjoy the spectacle.

Lightning is both a blockbuster and a boon to mankind—one of the most dramatic examples in nature of the ill wind that blows good. It is true that it kills more people in the United States than any other natural disaster; an average of 400 dead and 1,000 injured every year, according to Census Bureau reports. It destroys 37 million dollars' worth of U. S. property annually—and this figure does not include the losses from some 7,000 forest fires started by lightning. Yet it is also true that without lightning, plant life could not live.

Eighty percent of the earth's atmosphere is nitrogen—an essential food for plants. About 22 million tons of this nutriment, worth about \$300 a ton, float over each square mile of earth. But it's pie in the sky; for in its aerial form, nitrogen is insoluble, unusable. It's locked up, chemically. Before plants can take their sustenance from it, it must undergo what our food undergoes in our digestive machinery: a series of chemical reactions. Lightning touches off the series.

This extraordinary process was described for me by Dr. M. F. Fogler, executive vice-president of the Nitrogen Division of Allied Chemical & Dye Corp.



THUNDERCLOUD IS MUGE ELECTRICAL MACHINE, Violent movement of water droplets and ice particles inside cloud separates electric charges to make top positive, bottom mostly negative. This causes ground under cloud to acquire positive charge. Eventually, electricity reaches downward from cloud in "leader" stroke.

Air particles are made white-hot when stroked by lightning. They reach temperatures as high as 30,000 degrees C. Under this intense heat, the nitrogen combines with the oxygen in the air to form nitrogen oxides which are soluble in water. The rain dissolves the oxides and carries them down to earth as dilute nitric acid. You can smell this acid—the pungent, tingly odor that hangs in the rainy air of a thunderstorm. Reaching the earth, the nitric acid reacts with minerals in the soil to become nitrates on which plants can feed.

Here is a wonder indeed: Lightning, which meteorologists estimate to be bombarding the earth at a rate of more than

# Lightning

lightning gives life to earth by supplying plants with nitrogen





MAIN BOLT STRIKES UP. As atoms in air ahead of leader break down into negative electrons and positive ions, positive ions flow up toward cloud. This is the "streamer," the very bright and powerful flash of electricity. It meets the down-hanging leader to make a continuous path for current from ground to cloud.

MOST BOLTS STRIKE TWICE, some even 40 times, as different concentrations of charge flash new "dart leaders" along path of ionized air created by first discharge. The new leaders trigger upward streamers of their own, still along original path. The multiple discharges come so close together they seem to be one.

100 times a second, transforms the upper air into fertilizer for earthbound plants! At their present rate it is estimated that thunderstorms deposit in the earth about 50,000 tons of nitrogen a day!

The story of lightning is one that sings between the lines of the greatness of science. Every American child knows that the story began with Benjamin Franklin and the kite that led to his invention of the lightning rod. That simple device, basically unchanged since Franklin's day, must be included in any list of great inventions and credited with having saved countless lives and property. But flying the silk kite in a storm was only an incident in six years of work

on thunderstorms, resulting in discoveries that made the great English scientist Joseph Priestly hail Franklin as "the greatest" since Sir Isaac Newton.

Very little more was learned about lightning until an August afternoon in 1920 when a bolt struck a gnarled "snake tree" a foot away from an unoccupied lakeside shack owned by Charles P Steinmetz, "the wizard of General Electric." The bolt bounded off the tree and broke a window; it splintered a work table, then leaped across the room and shattered a mirror.

Discovering the debris, Steinmetz had every fragment and splinter of the mirror collected and fitted together between two sheets of glass. It was the first time that the pattern struck off by a lightning

charge had been studied,

The broken mirror sparked a perilous exploration. Now scientists devised instruments to measure and record bolts. They hunted lightning, trapped it in bottles and on film, learned how to make it in the laboratory, then how to carry it with them into the field so that they would not have to wait for weather to study its behavior. They even developed a camera that takes what amounts to a high-speed, slow-motion picture of a lightning bolt, exposing its separate strokes.

Scientists were urged to make these

studies because of the growing dependence on electric power. Lightning plays rough when it hits electric lines, and it hits them frequently. (In the Midwest every mile of a 100-foot-high power line is hit once or twice a year.) Lightning can run along the line directly into expensive machinery in the powerhouse or transformer station, or—if it makes an arc to the ground before it travels that far—it will be followed by all the electricity in the line until the line is drained or shut off.

The scientists eventu-

ally learned how to control the power failures. But to do so they had to find out how lightning is made. Rarely have explorers venturing into previously unknown parts of the earth brought back a more dramatic story of natural wonders.

To begin with, a thundercloud gets under way when warm, humid air rises from the earth in a steady updraft, generally over a hill or mountaintop. The humidity condenses as the air cools on rising. We see the tiny water droplets as mist which gradually assumes the familiar shape of a cumulo-nimbus cloud. Sometimes looking like a huge cauliflower, sometimes in the shape of an enormous white anvil, the cumulo-nimbus is often topped by the "cirrus umbrella." It is composed of billions

upon billions of minute crystals of ice.

These formations can be enormous—up to 50,000 feet in height. They can contain as much as 300,000 tons of water. In them is a so-called "chimney current"—a column of air rising at a full gale force of about 100 feet a second. The moisture in this column condenses rapidly, and the droplets are swept upward to freeze into hailstones. The hailstones do not fall. They dance on the chimney current like celluloid balls on a gushing fountain, rising steadily higher until, near the top of the cloud, the force of the current is exhausted. There the hailstones shower out in all directions, carrying

cold air with them as they descend. Frequently they are sucked back into the chimney current on the way down to be dissolved and reformed again and again.

In this turbulent motion something still unexplained happens. There is a separation of electric charges. The smaller particles near the top of the cloud become charged positively, while the raindrops in the lower portion of the cloud are charged negatively.

Meanwhile, on the surface of the earth directly below the cloud there is a correspond-

there is a corresponding build-up of a positive charge. It forms
a mirror image of the cloud. As the cloud
drifts, carrying the negative electrons
with it, the positive charge on earth follows it like a shadow, climbing trees,
church steeples, towers, poles. It races
into houses and climbs chimneys, water
pipes, TV aerials, lightning rods—whatever can bring it closer to the cloud,

Enormous differences of electric potential develop between the top and bottom of the thundercloud, and between the bottom of the cloud and its image on the earth.

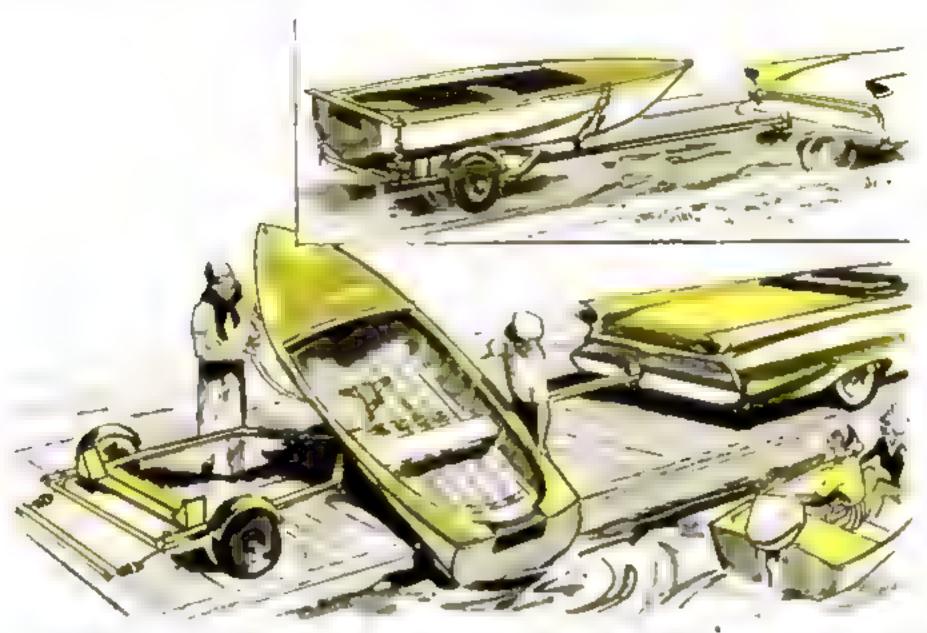
Suddenly a thin, white arm reaches down for perhaps 50 feet from the base of the cloud—a "leader." It is a gaseous are path, reacting to electricity like the



LIGHTNING RODS PROTECT a model house against man-made strokes in Westinghouse laboratory. Franklin's great invention prevents damage by channeling bolt's tremendous current into a safe path to the ground.

[Continued on page 186]

## New Ideas from the Inventors

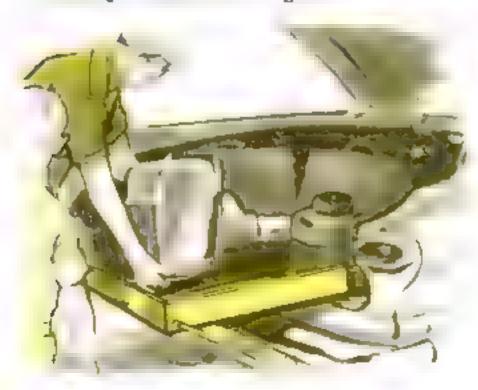


1 Swivel Trailer Floats Soat. Two padded, spring-supported cradles on this recently patented trailer would secure a boat, cushion it against road

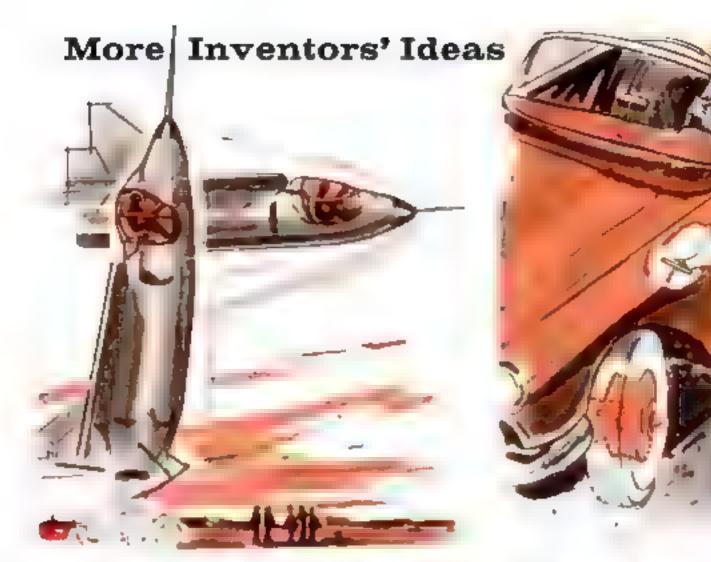
shocks, and simplify handling in or our of water. Swiveled on the forward cradle, a boat could be more readily loaded or offloaded over the edge of a beach or dock.

2 Platform Extends Car Trunk. You'd have more room for extra or outsize luggage with this slide-out trunk extender and its bumper-braced supports. Folded in, the platform would become a raised floor that could cover a spare tire, hold ordinary trunk-carried gear.

3 Candy Makes Kids Say "Ahh." A flavorful candy coating on one end of a wooden tongue depressor should make throat examinations pleasanter for both doctors and their younger patients. For still further solace, a child would usually get to keep the medical lollipop.





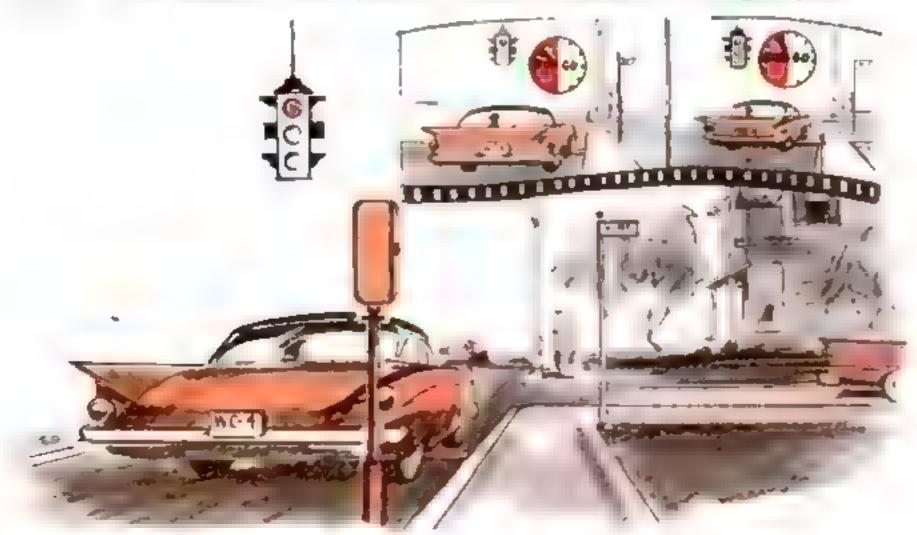


4 Seat Levels Jet Pilot. The pilot would sit upright in this VTO jet both while it was taking off vertically and flying level. Automatically adjustable through a 90-degree angle, the cockpit, controls, and seat would remain level regardless of the inclination of the plane.

5 Air Brakes Inflate Tires. You'd never need gas-station air-pump service if you could regulate tire pressure by pedaling the brake. These disk brakes and tubeless tires would share the same air supply. Replenished as you drove, valves would maintain any preset level.

6 Camera Traps Light Jumpers. To obtain reliable evidence of traffic violations (and thereby discourage light jumping), this inventor would synchro-

nize a camera, clock, and traffic light. Two sequence films, like those shown, would automatically record a car's movement in relation to the light cycle.





7 Claw Pulls and Catches Nails. You wouldn't have to sweep up scattered nails and spikes if your hammer had a receptacle like this clipped just below the prongs. It wouldn't interfere with normal claw action and pulled nails would fall (or be prodded) into the container.

Wertical Wipers Wipe Blind Spots. Horizontal wiper blades, moved up and down by plungers, might banish the rain-misted arcs left by conventional wipers. The blades could lap at the center, span the full width of the glass, and conform to wraparound curves. Linked to the plungers by bent rocker arms, a conventional motor would drive the wipers.





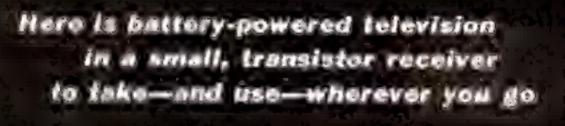
9 Belt Switch Frees Your Hands. You could snap a flashlight on or off by extending or relaxing your stomach muscles if it was wired through this switch. Designed for momentary, no-hand control, the belt switch could be used with battery-powered tools to supplement regular, sustained-operation switches.

The following patents have been Israed on these inventions I Patent No. 2,76s 180 to Charles J. Albera, Center, N.D., 2 No. 2 1,2011 to George J. Zeaberi, Detroit 3, No. 2,857,908 to Levice 5 Cornheld Los Angeles, 4 No. 2,858,477 to Herbert E Chaplin Haves England 5 No. 2,866,525 to Arthur I Bouer, Umaha 6 No. 2,871,088 to Fronk Abell Inglewood, Col. 7 No. 2,768,809 to Belie 4 Kandarian, Fresno Col., R. No. 2,677,844 to Daily McClaison, Sc. Henton, Ili., 9, No. 2,681,935 to Vilbur II Daily Brookton

Copies of patents may be ordered by number from the Commissioner of Patents, Washington 25. D.C., at 35 cents each. To write to an intentor of the address given above is insufficient tou may address him flix name and patent number) in case of

the Commissioner of Patents





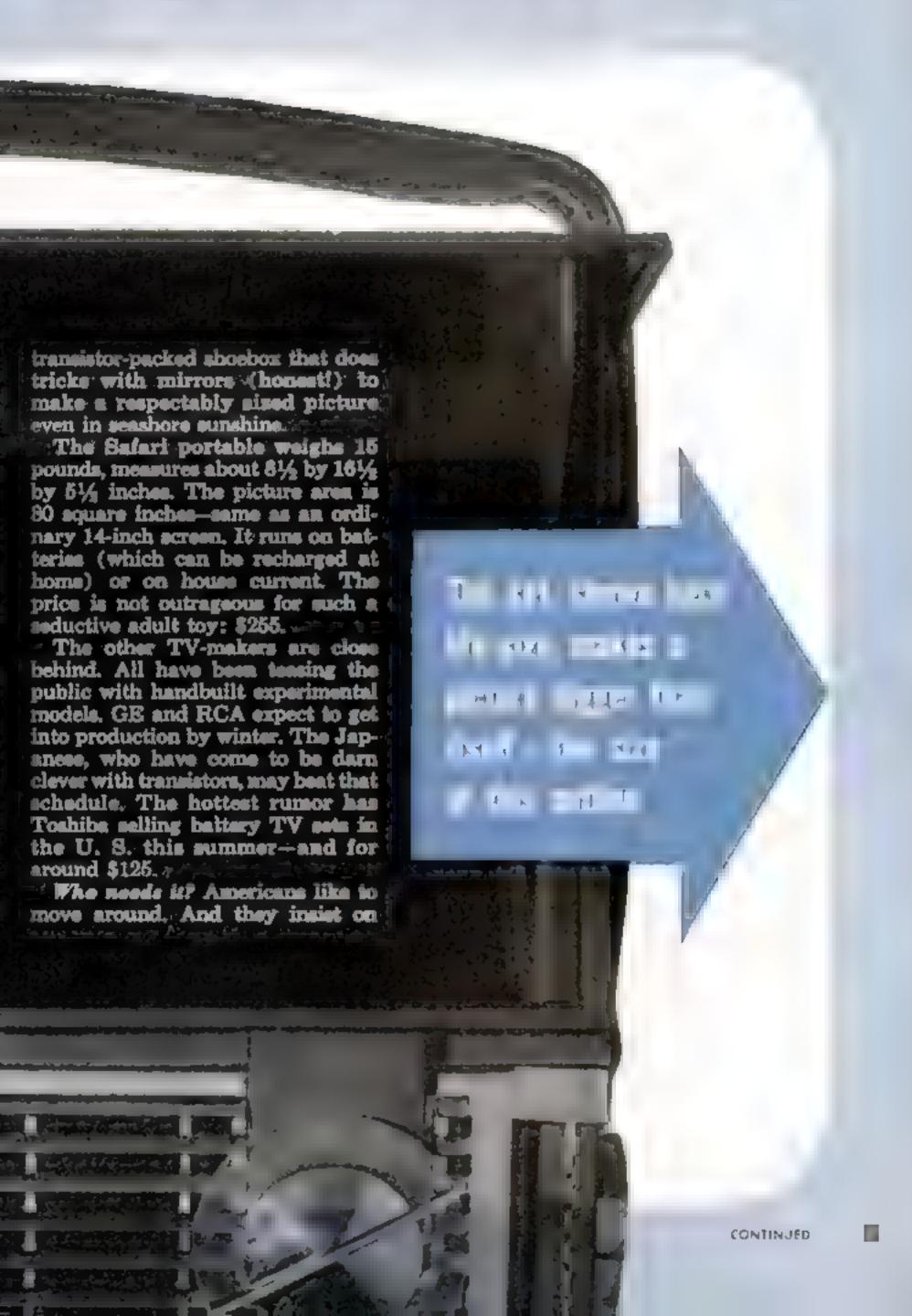
#### By Martin Wann

TOW they've gone and done it.
They've built a TV set you
can take with you: a genume portable—battery-powered. You
no longer need a power cord, or an
outlet, to plug it into.

out under water. You can go to the beach without missing the ball game, majoy Lawrence Welk from a cance, catch Jack Paer while comping out more practically, keep a child quiet in the back seat on an auto track.

Philos is first, by virtue of remark andly sime ginetive angineering. Its production lines near new plansping and the Sefari, a leather covered.

# Portable TV



## Mirrors turn the trick: From small tube, cheap battery, they make a big picture you can watch in bright sun

taking their entertainment with them the magazine rolled into a pocket, the portable radio held at ear level.

Carry-along TV is a natural addition. Even at home, it's a convenience: You can take it out into the back yard, or simply move it from room to room without crawling around stabbing at an outlet.

But the manufacturer's motive for gambling a million or so on such a new product can be considerably more complex. He may hope that (a) people will buy the gadget because it is a Practical and Useful Convenience; or (b) people may not need the gadget but will buy anyway because it is The Thing to Do, like dancing the cha-cha-cha; or (c) people will come into the store to see the Amazing New Invention and end up buying something else he wants to sell, as they look at convertibles and buy sedans.

What's so difficult? All the big electronics labs have had orders from above: Make us a salable transistor TV set. The resident geniuses failed to deliver, until now, for three very good reasons:

 Picture tubes were too bulky, too heavy, and too hungry for electricity.

Batteries were too bulky, too heavy and too weak—unless very costly.

Transistors for the very high frequencies of television circuits were too expensive, mainly because they couldn't be manufactured uniformly.

Problem number three is in hand. Philco has geared up an automatic assembly system that cranks out transistors more than a third cheaper than before. Even so, a Safari contains 60-odd dollars' worth of transistors.

Recent developments in rechargeable batteries ("Clever New Gadgets Run on Flashlight Batteries," PS, March) ease the power bind somewhat, although hardly enough to suit the TV designers. They don't make batteries, and can afford to be unreasonable. The Philos set contains a package of five cells (labeled Philos but made by Eveready). It goes four hours between charges, can be recharged maybe 20 times, and costs around five bucks to replace when it's finally shot—about six cents an hour for power.

This is a pretty small battery. The

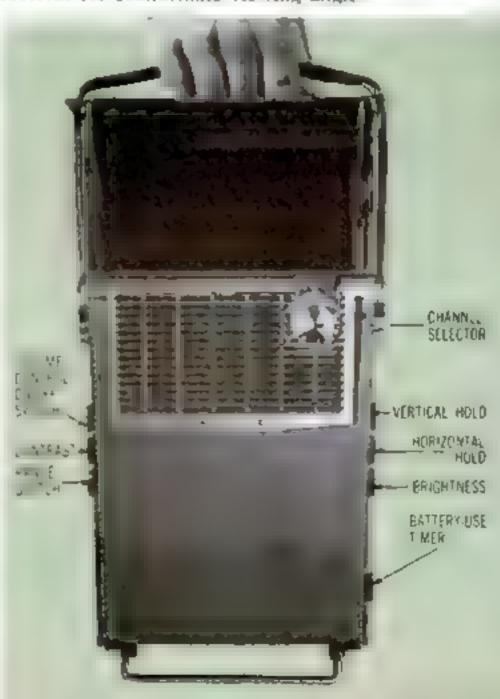
a living-room receiver draws 200. Philos gets away with it partly by prudent design (project engineer Al Curll remarks, "We wouldn't dream of adding a pilot light"), but mainly it's because of a unique solution to the picture-tube problem.

The ideal solution would be a solid picture tube, built like a transistor to operate on a trickle of power. So far this is still a gleam in the eyes of the longhairs who practice quantum mechanics

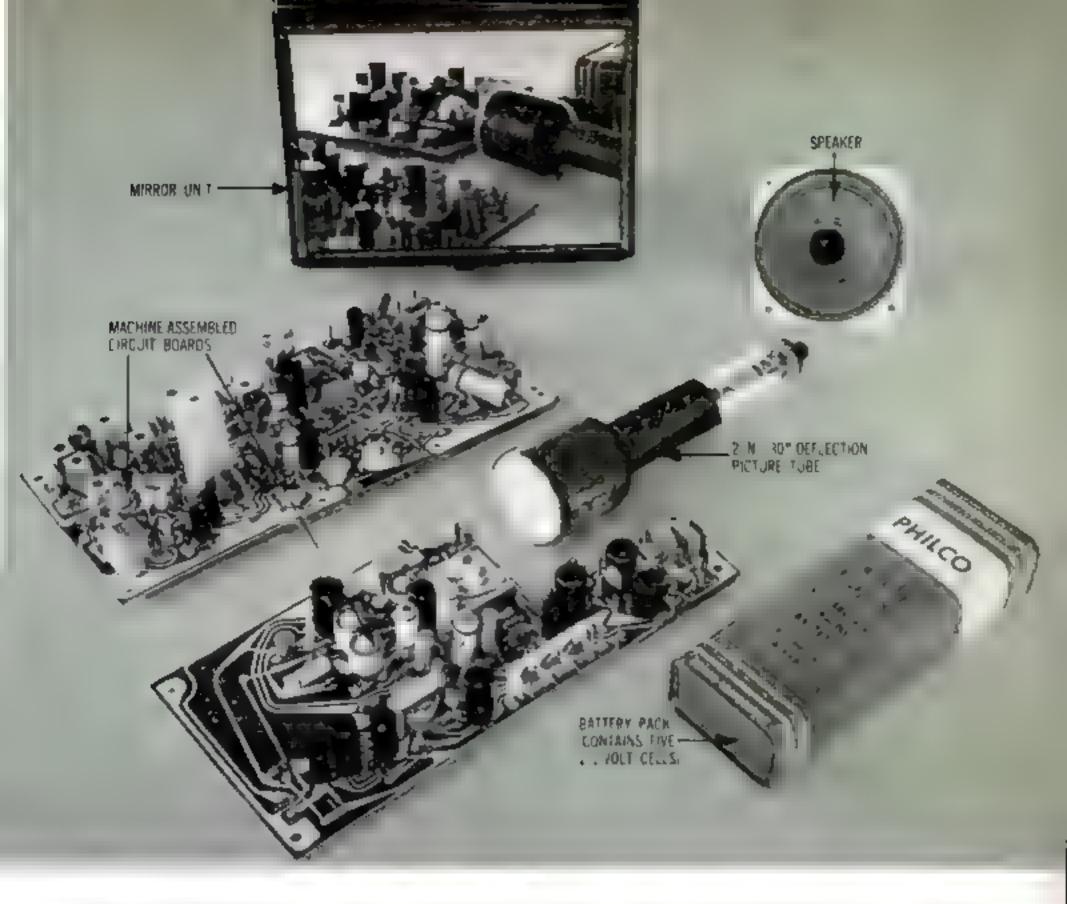
Phileo pnessed. The bright idea came to research v-p Dave Smith when he was flipping through that standard source of inspiration, the Sears, Roebuck catalogue, He saw Sears' slide viewer

The slide viewer is a \$10 optical gadget that shows you an enlarged image of a 35-mm, photo transparency when you hold it up to your eyes. The picture

compact and lightweight, Phileo's Safari is a bit larger than a shoebox, weighs 15 pounds Most of bulk is accounted for by mirrors pacture tube and battery pack (opposite page Transistor-studded boards form sides of chassis Visor (shown up) shades viewing system, protects it when closed. Brass stand adjusts to filt receiver for comfortable viewing angle.



66 POPULAR SCIENCE AUGUST 1959



seems to float in space some distance behind the viewer. It is a "virtual" image, like the image of yourself you see when you look in an ordinary mirror—your reflection appears to be a person standing behind the mirror.

The same kind of optical system sits atop the Philos portable. It has a concave mirror to magnify the face of the picture tube. To see this magnified picture, your eyes focus on a point four feet behind the TV set. So the image you watch is large, and appears to be hanging in space behind the set.

And that's the secret. It means:

 You can use a very small picture tube—two-inch screen—with great savings in cost, bulk and weight.

A small tube gets by on less electricity, so you save on batteries. The reason is that much of the power goes to swing the electron beam back and forth.
 A small tube can be built with a narrow

swing (30 degrees instead of 110) without becoming impossibly long.

 Bright sunlight can't wash out the picture because you don't look at the tube face directly. The image you focus on is four feet behind the case, so you can stick your head right up under the little visor and watch in comfort.

Naturally, you don't get all this for nothing. The small tube has to be carefully made, precisely positioned and protected against dust. Otherwise, any defect will be magnified along with the picture.

More important, to see the picture at all you have to sit close to the set and squarely in front of it. If you move off the center line, the image slews out of sight. And this means just one person can watch. Two people can see only if they are on very, very friendly terms.

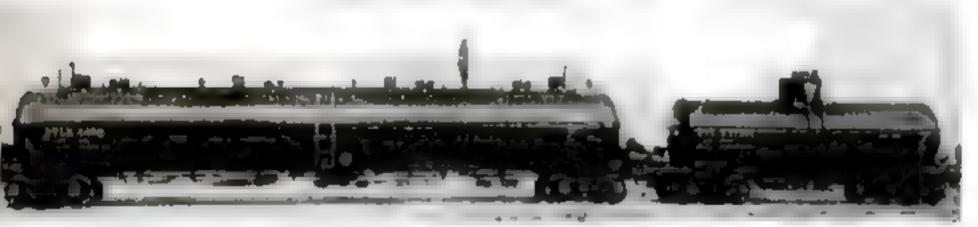
How good is it? Philco's engineers were ordered to produce a genuine portable. It

[Continued on page 192]

## PS Picture News



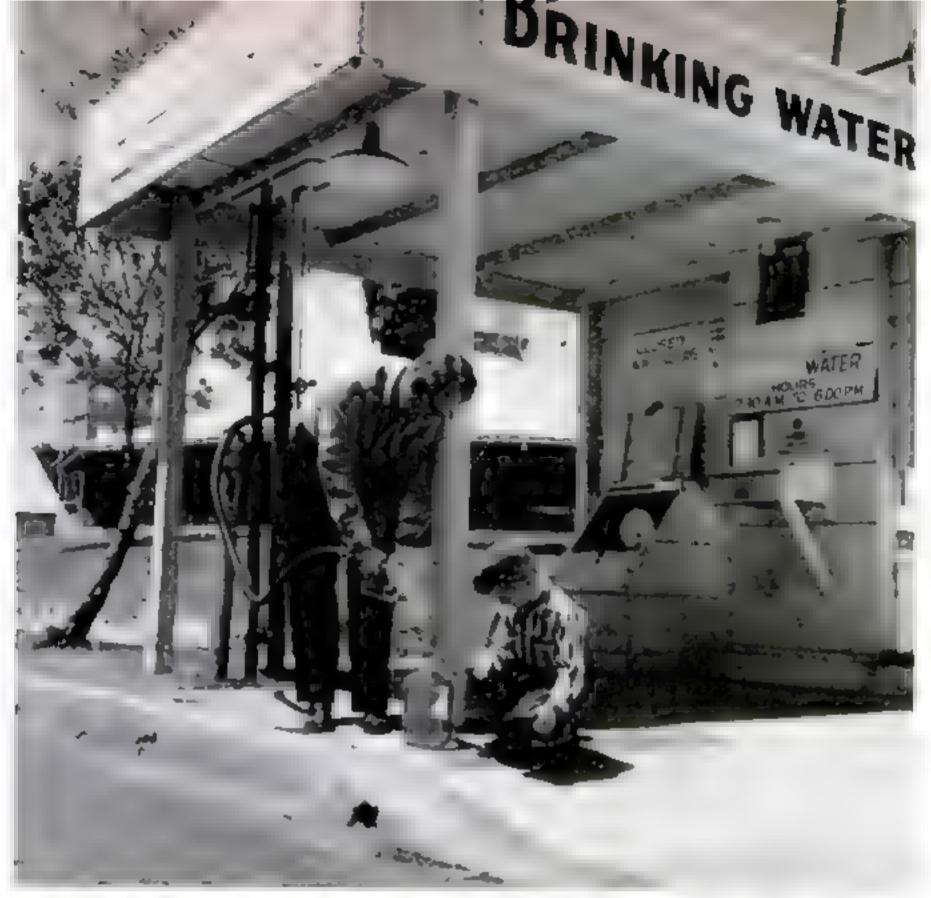
**SKY CATCH.** Here's the newest wrinkle in launching the Navy's Polaris. The sequence photos above show a dummy missile blasting off, being snubbed by a carrier arresting gear, finally lowered back down after the catch. The operation makes retrieving easy, permits study of launching stresses.



TANK WHOPPER. This huge tank car is 67½ feet long, 14½, feet high. It holds 21,800 gallons in four 5,450-gallon sections, dwarfs a standard 8,000-gallon car (right). It was built by Union Tank Car Co. to carry lubricating oils from Pennzoil refineries to storage and distributors.



TURF TRAMPER. Revolving feet and spiked rollers on this machine spend their time scuffing lawns. The gadget was developed by a UCLA professor to test wearability of various grasses. The wheel riding at an angle (right) was designed to simulate a golf cart under severe conditions.



A NEW KIND OF FILLING STATION caters to people who live beyond Coalinga's water pipelines.

At the city's demineralization plant, they can load up for a cent and a half a gallon.

## This Town Drinks 'Undrinkable' Water

Coalinga, Cal., has found a way to wet its whistle with water from brackish wells

A LITTLE city on the western edge of the great, central San Joaquin Valley of California is gurgling its way into history.

Coalinga is the first city in the U.S. to draw all its drinking water from a vast underground source—one no American city has relied upon before. The water gushes to the surface from wells as deep as a quarter of a mile below this prosperous oil-and-farming community of 6,500 people. It's naturally undrinkable. Before treatment, it tastes as if brass had been stored in it, is disagreeably laxative and so hard that it curdles shaving cream lather to the consistency of cottage cheese.

The town now runs this clear but repellent liquid through a series of electrified filters. These remove more than 85 percent of its high mineral content After that, it tastes delicious and is soft enough to suit the most finicky laun-



WATER FOR ALL NEEDS. After 60 years of hauling in drinking water by railroad, town now produces more than it requires. Surplus is stored in 75,000-gallon tank in foreground.

## Untreated, Coalinga's water is

dress. The city demineralizes 28,000 gallons a day, drinking 17,000 of them and storing the rest in an elevated, 75,000-gallon tank.

The underground water supply in this isolated part of California, 50 miles southwest of Fresno, is brackish. It contains a far larger proportion of dissolved minerals than fresh water does, though much smaller than that of salt water. Veins of brackish water, sometimes hundreds of feet thick, run for hundreds of miles under land that receives very little rainfall. Next to the oceans, these veins are the most plentiful source of water in the world. Yet, until lately, when the steadily falling fresh-water table began to cause serious concern, no one gave much thought to making such brackish water drinkable.

Coalinga was a logical community to try first. If it had to depend on rainfall, it couldn't exist. Water to irrigate the enormous fields of barley, oats, alfalfa and cotton has been pumped from deep, brackish wells. Since 1926, Coalinga has drawn upon its own bitter wells to sprinkle lawns and flower beds, wash cars, flush toilets and fight fires. But for 60 years, until last March, all its drinking water arrived in railroad tank cars, which hauled it 45 miles.

Imported water was at first emptied into a cistern beside the tracks and pumped out by hand. Later, it was carried throughout the town by water carts to 80-gallon storage tanks in people's front yards. In 1926, two tall, central storage tanks were erected, one for drinking water, the other to hold brackish water for less-exacting domestic uses. Each tank was provided with its own pipeline network to the town. The existence of a separate, metered distribution system for drinking water made it less costly to switch from tank cars to a demineralization plant last March.

The electric-membrane equipment that now makes the city's undrinkable water drinkable is built by Ionics, Inc., of Cambridge, Mass. Similar apparatus is in use on Texas Towers in the Atlantic, at a U.S. radar base in Montana, and at a few oil-producing stations in the Middle East.

Its functioning depends on the fact that salts and minerals in solution break

#### brassy, laxative, and so hard it curdles shaving cream

down into invisible particles with positive or negative electric charges. These charged particles are called ions. When a mineralized solution is placed in a container between positive and negative electrodes, a direct current is passed through it, Positively charged ions tend to move toward the negative electrode, negative ions toward the positive electrode.

The basic unit of the Ionics equipment is a stack of 300 thin sheets, or membranes, of ion-exchange resin. They are separated by 300 spacers with intricate channels cut in them for water to follow. Membranes and spacers are 18 by 20 inches in area, each only a few thousandths of an inch thick. Altogether, they make a pile two feet high, clamped between steel plates containing electrodes.

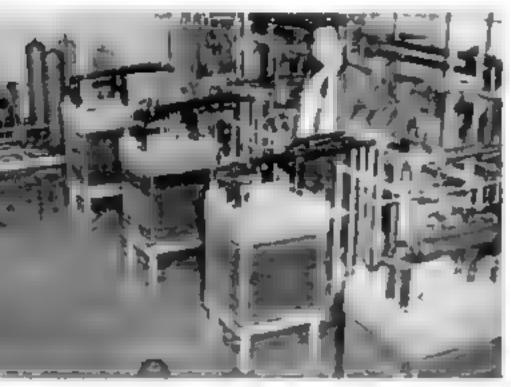
Brackish water is piped to and from the stack in two separate streams, circulating through alternate spacers. Water can't penetrate the membranes, but ions can.

When the electrical current is turned on, half the membranes allow positively charged ions from the water, such as sodium, calcium, sulphur and magnesium, to pass through them. Alternate membranes permit only negatively charged ions to get by. As a consequence, one stream of water constantly loses part of its mineral content, while the other stream gains some.

The greater the concentration of minerals in the water, the more stacks are needed to make it drinkable. Coalinga uses four, looking like a row of beehives.

The entire demineralization plant doesn't take up much more space than a large living room. Brackish water, at the rate of 30 gallons a minute, is pumped through each stack in turn. The stream being sweetened for the city to drink— 20 gallons a minute of the total flow loses about 40 percent of its remaining minerals in each stack. The rest of the water is called the waste stream, but not much of it is wasted. Seven gallons a minute are routed into one or the other of Coalinga's two small, roofed reservoirs. for any use but drinking and cooking. Only three gallons a minute go into the sewer. They contain not only concentrated minerals but an acid solution that cleans mineral accumulations off the membranes in the stacks.

Though three or four citizens thought at first that they detected an unpleasant change in the taste of their drinking water when Coalinga changed over from tank cars to electric membranes, most members of the community seem satisfied. One aspect of the change pleases them very much. Drinking water hauled in on the railroad used to cost \$7.50 per 1,000 gallons. Coalings now produces its own for around 80 cents per 1,000 gallons. And once the new plant is paid for. residents can look forward to a generous cut in the cost of wetting their whistles. -Wesley S. Griswold.



DITTER WATER IS MADE SWEET at Coalinga by being pumped through these four stacks of electric membranes, uncovered for the photo by R. O. Phelps, Superintendent of Public Works.



THESE ARE SAMPLE MEMBRANES from a demineralizing stack, with a spacer between them. The darker membrane lets only negative ions get by; the other one passes only positive jons.

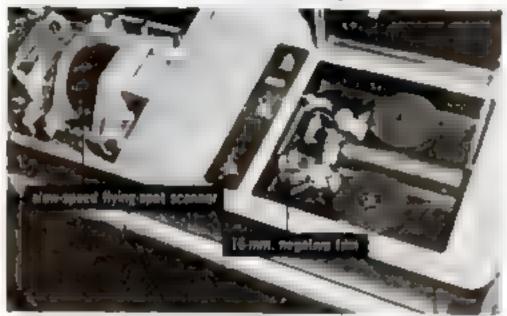
### TV Crosses Atlantic By Going Slow

#### How it's done:

Hovies of scene are oibute at berteur for fast processing



16-mm. negative film is passed through I film-scanning console below



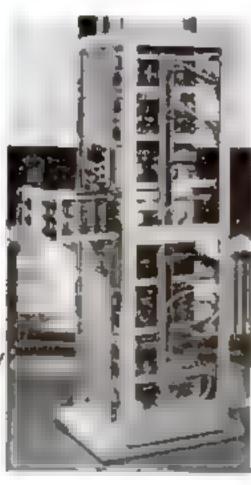


Electron beam acens 200 horizontal lines across every other frame of film, taking 8 seconds to complete

Electrical signal from scanner, corresponding to light and dark of picture, in impressed on carrier wave by modulator (right)

through transatlantic telephone cable. British Broadcasting engineers remove fine details from pietures to be sent by (1) limiting horizontal definition, (2) slicing each picture into 200 horizontal lines instead of the 405 standard in British TV and (3) skipping every other picture completely. This still leaves 100 times more information per second than phone cable can handle. So they slow down the actual transmission 100 times, taking 100 minutes to send one minute's worth of film. Time is speeded up again to normal at receiving end, but detail cannot be restored and pictures are coarse and contrasty, as actual photo (at right) of the TV image received in the U. S. shows.

BIG SQUEEZE gets TV film pictures





Modulated carrier wave enters transatiantic telephone cuble in Scotland

**7**OU can watch Europe on your TV set now, thanks to clever electronical and optical trickery that gets the pictures across the ocean fast by slowing them down.

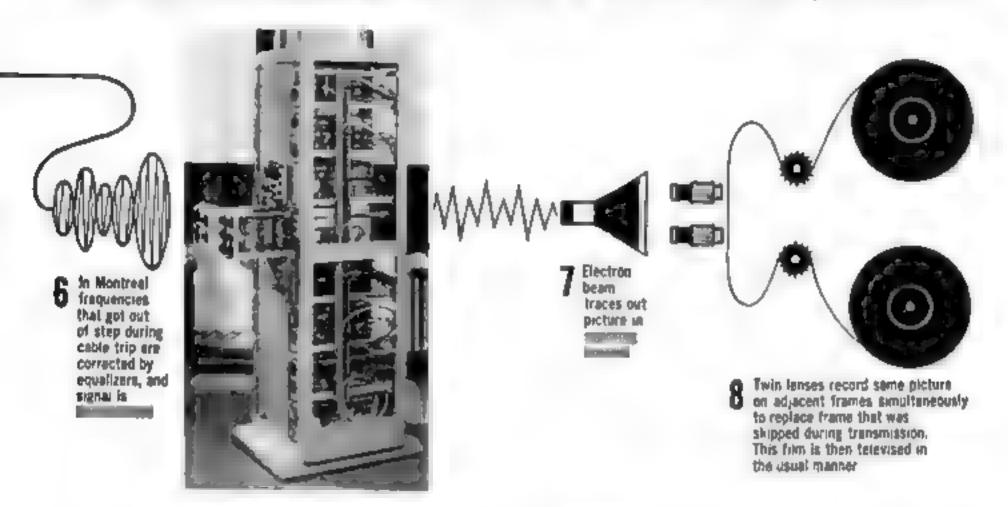
Transatlantic telecasts began this summer in proper regal fashion with a shot of Queen Elizabeth boarding a Canadabound jet. The scene lasted two minutesbut required 21/2 hours to transmit over the telephone cable. Previously movies had to

be flown across the Atlantic for telecasting (best time: eight hours).

This is Europe-to-America TV direct, but not live. Movies of the scene are rushed to British Broadcasting Corporation atudies, processed, and then converted into electrical signals by a special TV scanning device. The signals cross the ocean to Montreal over the transatlantic telephone cable, are then converted back into light and put on movie film again. The regen-



First cabled TV looked like this. Photo was made off his home TV screen by PS' Bill Morris.



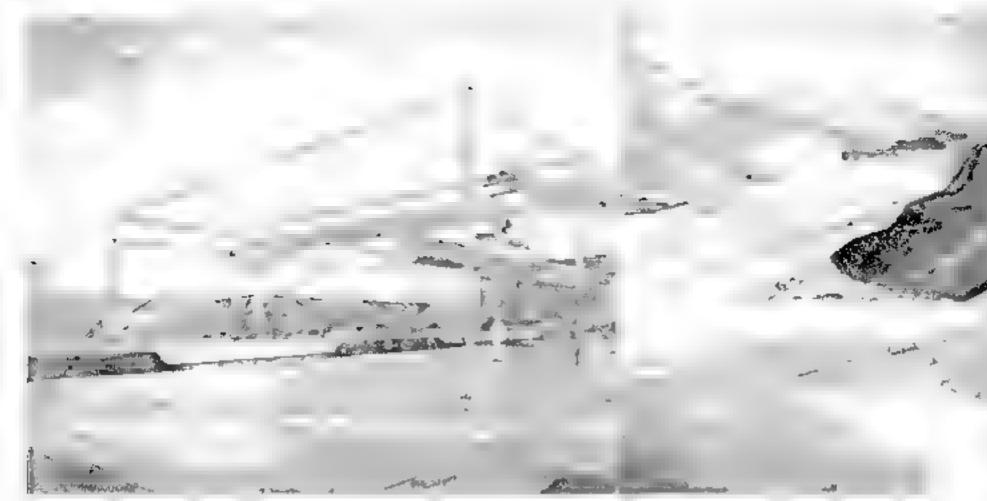
to the rest of Canada and to the U.S. the same way ordinary TV movies are.

The system for cabling movies (see sketches) is similar to the one that newspapers use to transmit still photos by telephone.

The hard part is getting the pictures over the telephone cable - movies carry some 4,000,000 "bits" of information per second, while the cable has room for only

erated film is transmitted from Montreal 1,500 bits per second. The secret is to slow down the movies and reduce the information content electronically,

Live TV (50,000,000 or more bits of information per second) still can't squeeze into the narrow pathway of a telephone line. That kind of a show will have to wait high-orbiting communications satellites (PS April), which can bounce information-loaded radio beams across the ocean. One should be in orbit in a year or so,



Railroad missile car is loaded at right-of-way warehouse.

Underground roundhouse could

### Could Rail-Riding Missiles Avert Surprise Attack?

U. S. experts propose new strategy—firing missiles from railway cars—to solve problem of sitting-duck rocket bases

OR almost two years—ever since Russia's Sputnik I soared into orbit-the U. S. has been worrying about the possible destruction of its retaliatory missile bases by a surprise attack. These permanent sites for our own intercontinental ballistic missiles could theoretically be wiped out in a twinkling.

Now the Air Force believes it has come up with an answer-put the missile launching pads on railroad cars. Keep shunting them around the country, and so play hide-and-seek with an enemy as our mis-

sile-armed subs could do at sea.

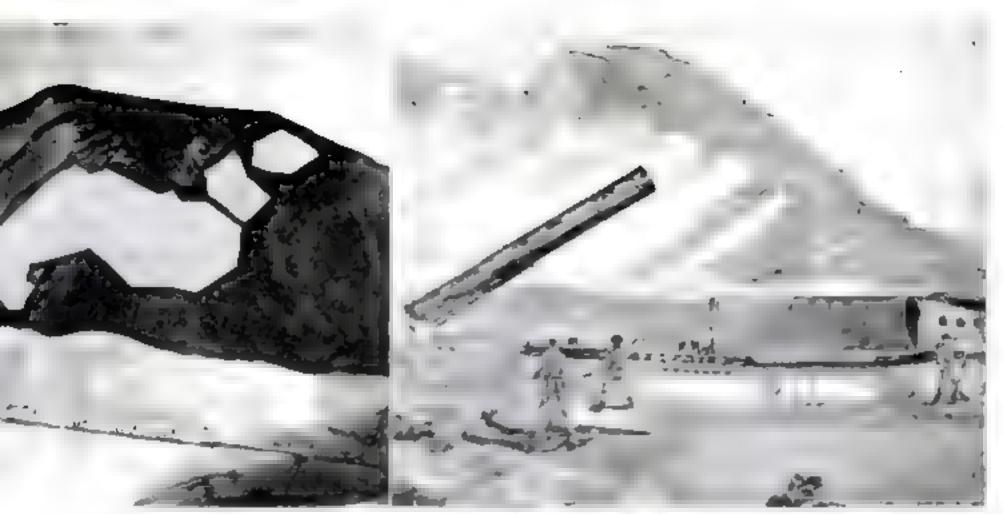
Plans have been drawn for manufacturing perhaps as many as 200 missile railroad launcher-trains. They would travel camouflaged over the 389,000 miles of railway trackage in the U S, lost to hostile missiles among each day's 15,000 freight train movements. Some trains would be on the go constantly. Some could be dispersed at sidings, in mines, tunnels, and warehouses. The trains could launch scores of ICBMs toward enemy targets within minutes of notification.

The missile trains are designed to fire the Minuteman, a solid-fuel, 55-foot weapon to be operational in 1962.

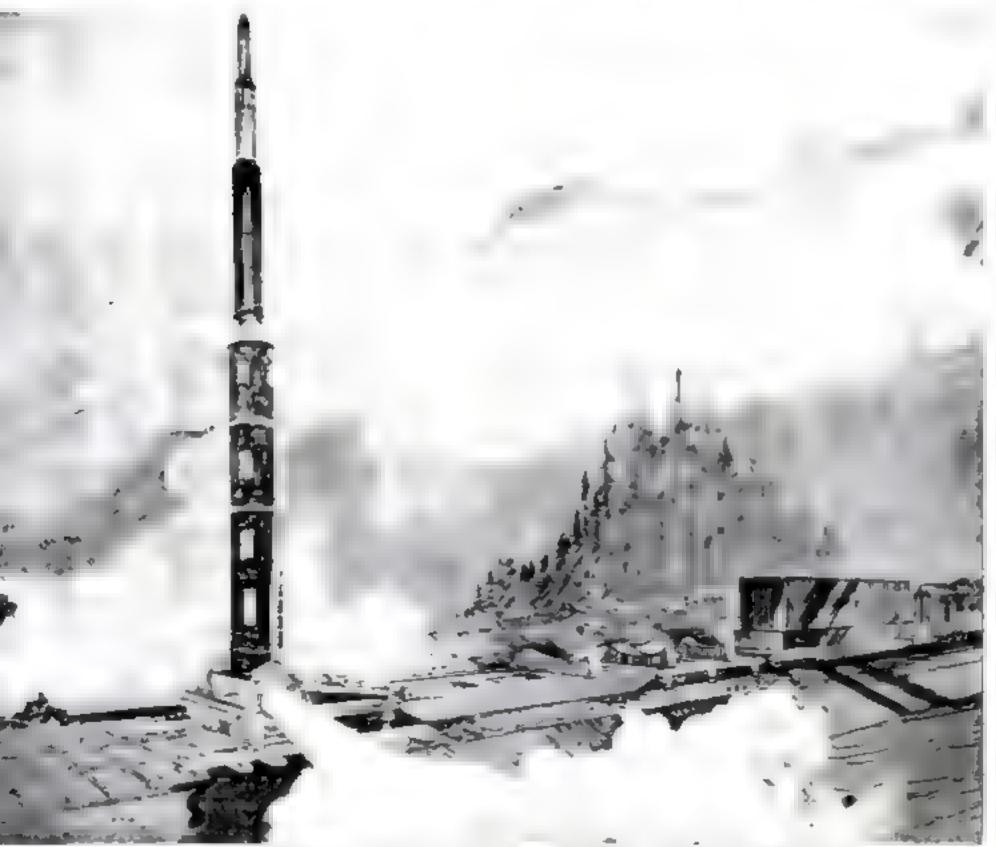
A President's Committee has made a further recommendation—that such trains be manufactured for nations in the North Atlantic Treaty Organization. These would ride the Western Europe rail network carrying the Polaris missile.

As yet, no green light has been given a manufacturer. What the mobile missile launchers might look like is shown in the accompanying artist's conceptions of designs that have been drawn jointly by Paul Hardeman, Inc., of Los Angeles, and the Bethlehem Steel Co.

14 POPULAR SCIENCE AUGUST 1959



be used to conceal launcher cars. Power rams raise steel-capsuled missile to firing position.



Missile is fired directly out of the capsule. Steel shields deflect flames from the launcher.

#### **PS Picture News**



HIGH RIDER. The tractor on stilts shown above in a gooseberry field in Kent, England, is a conversion from a standard tractor. It's made for harrowing between rows of crops up to  $4\frac{1}{2}$  feet tall. Wheels can be set five, six or seven feet apart.



BABY AMPHIBIAN. This new light plane carries two people, and has a range of 350 miles. Its 85-hp. pusher engine gives a cruising speed of 80 m.p.h. Built by Jensen Aircraft, Glendale, Cal., it has manually retractable landing gear.



#### BOLTED HOUSE.

A prefabricated twostory building (right) on the University of Michigan campus was put up with wrenches. Its paneled interior (left) can be altered quickly, worn parts can be discarded and replaced, or the entire structure can be dismantled, moved and reassembled easily.





RAINMAKER. Long swinging arms of the big sprinkler at left irrigate an acre of California grain land in one setting. The 70-foot nozzle booms can be lowered for moving under power lines to other parts of the field. When spraying, they rotate like a lawn sprinkler.

76 POPULAR SCIENCE AUGUST 1959

#### "I'd like to see them make..."



OVERHEAD TOWLINES for use on bridges and in tunnels. A stalled car could be hooked to the line and pulled out of the way fast.—Alexander Morris, Mahopac, N.Y.



A TOOTHERUSH on a flexible cable that could be attached to an electric razor. It would clean your teeth with a rotary motion.—W. R. Bottger, Oklahoma City.

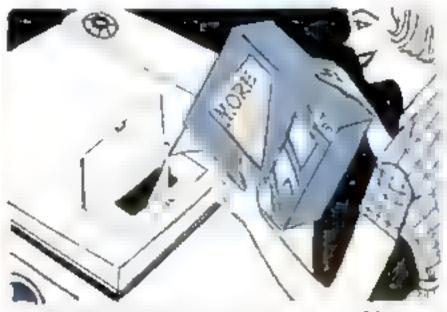


A SACK PACK FOR OUTSOARD MOTORS. Clamped to a board mounted on the pack, the awkward motor could be carried with greater case.—
R. M. Woodbury, Natick, Mass.



A TRANSPARENT MAILBOX. With a clear plastic box you could see if mail had been delivered. The box wouldn't rust or require painting.—

Rick Vegenity, Seattle.



A POWDERED-SOAP DISPENSER you could re-use on each new carton. Like a jugger dispenser for liquor bottles, it would pour out a measured amount.—Carl Herschfeld, Los Angeles.

Exercone has his non-pet idea of a gadges that he would have to see in general use. The five ideas at strategy as overwere suggested by Portian School readers. Where a

triggs? We will pay 85 for each one of linked. Please use Concernment postcards ones. White name and address cleaner Congident to returned

Here's where your auto dollar goes.
Some items you can't change, but—

# How Much Do You

Actually

### Save With a Small Car?



INSURANCE



REPAIRS

By Harry Walton, suther of Popular Science Standard Guido to Economy Care

"THY drive that little beetle just to save 50 bucks a year on gas?" asks the big-car fan.

"It's 50 dollars in my pocket," retorts the economy-car owner, "And I save still more in other ways."

What's the straight dope on small-car "economy"? To find out, I interviewed:

A prominent firm of fleet-cost engineering consultants.

 A commuter using two cars, one of them a Fiat 600.

Long-distance movers, whose estimators drive Renault Dauphines.

 A manufacturer whose salesmen use Kharmann-Ghia Volkswagens.

 A Hillman owner with a complete expense record for 100,000 miles.

 A small-city cab company operating Fiat 1100 sedans.

Their answers show that you can save with a small car on some important items.

Car expenses break down into two main groups—fixed costs that stand pat whether you drive 2,000 miles or 20,000 (insurance, license and depreciation); and variable costs that depend on the mileage driven (gas, oil, tires, lubrication, adjustments and repairs).

You probably won't save on insurance by buying a small car. Liability insurance costs the same as for a big one. Fire and theft coverage is priced on value—and a new small car may be worth more than an older large one. You'll probably pay more for collision insurance—the lower-priced \$100 deductible may do for a depreciated automobile, but fuller coverage is generally preferred on any new, largely unpaid-for one.

You do get a break on license costs in some states, thanks to the economy car's lesser weight and lower engine rating. In one case where both city and state licenses are required, fees for a Ford V-8 come to \$49. Licensing a Peugeot in the same area costs only \$21.50, A two-car salesman pays \$17 less each year to buy a New York plate for his tiny Renault 4CV than for his Cadillac.

Depreciation is a hard nut to crack with any car except the Volkswagen, which drops a few hundred dollars the first year. Among other imports, first-year depreciation runs from under \$400 on a Fiat 600, Hillman or Renault to over \$600 on a Peugeot and \$700 on a Borgward. On the popular smaller cars the average is 25 percent, whereas first-year depreciation on the American Big Three may be, some accountants say, as much as 39







DEPRECIATION

INTEREST ON LOAN

LICENSES.







OIL AND LUBRICATION

DATE OF THE PARTY 
#### How engineers compare costs of a V-8 and an economy six

BELOW are car-cost allowances for employees driving their own cars on company business, as computed by Runzheimer and Company, Inc., Chicago consulting engineers, who have been studying national fleet costs for 25 years. These figures, for automobiles operating in metropolitan Chicago, are based on a yearly average of 10,000 miles. Both cars have automatic transmission, heater, radio and other standard accessories.

Operating in metropolitan area where 50 percent of driving is "stop and go"	1959 FORD FAIRLANE V-8 two-door saden	1959 RAMBLER	
Standard miles per gallon	13.5	18.0	
Normal gas price in operating area: (per gal.)	33.0∉	33.0¢ 33.0¢	
Gasoline and oil: (per mile)	2.58#	1.93¢	
Meintenance: (per mile)	.70g	.704	
Tire repair and replacement: (per mile)	.47¢	.37#	
TOTAL VARIABLE COSTS: (per mile)	3.75¢	3.00∉	
Fire and theft insurance:	\$23.00	\$18.00	
Liability Insurance:	150.60 150.60		
City and state licenses:	49.00	23.50	
Yearly depreciation (21/2 year trade-in)	682.00	538.00	
Interest (on 75 percent of car price)	66.90	56.75	
TOTAL YEARLY FIXED COSTS:	\$971.50	\$971.50 \$786.85	
Fixed costs per mile (10,000 miles yearly)	9.71≰	7.87≴	
TOTAL ALL COSTS: (per mile)	13.46¢	10.87¢	

Gas mileage and maintenance are based on actual fleet records. Insurance and license costs are for the Chicago metropolitan area. Runzheimer and Com-pany base the depreciation figures on their recommended practice of trading a car at the end of 30 months or 45,000 miles, whichever occurs first. For

private use, a four-year trade is more economical and will reduce the annual depreciation by about \$175.

Interest costs assume you would need a loan of 75 per cent of the purchase price at five percent, and are averaged out over the 2½-year period (interest). falls off as payments on the principal add up).

#### Case-history cost for two popular economy cars

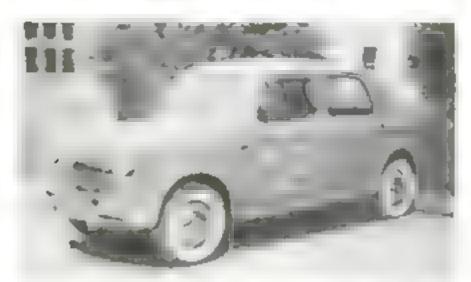
The figures at right are based on actual operating records of the Weeks Moving and Storage Corporation (Dauphines) and Frederick Lockwood (Peugeot). The Dauphines are driven in a metropolitan suburban area, and the gas mileage shown is a low fleet average. That for the Peugeot has been revised downward to approximate the same kind of driving. For comparison, gas, Itcense and insurance costs shown are for the Chicago area, and depreciation is figured on a 30-month trade-in. The Paugeot maintenance figure includes .626 cents per mule for actual repairs to date. plus an estimated .32 cents per mile for tires.



	RENAULT DAUPHINE	
Miles per gullen	33.4	28.0
Normal gas price (per galien)	33.04	33.0∉
Gaseline and ell: (per mile)	1.095¢	1.20∉
Maintenance and tires: (per mile)	1.234	.846¢
TOTAL VARIABLE COSTS: (per mile)	2.328¢	2.0464
Fire and theft insurance:	\$14.00	\$18.00
Liability insurance:	150.60	150.60
City and state licenses:	21.50	21.50
Annual depreciation:	375.00	450.00
Interest:	41.13	56.75
TOTAL YEARLY FIXED COSTS:	\$602.23	\$696.85
Fixed costs per mile (10,000 miles annually)	6.022¢ • 6.968¢	
TOTAL ALL COSTS (per mile)	8.35¢	9.01#

percent, or \$1,049 on a Ford, Chevrolet or Plymouth delivering at under \$2,700.

If, like most private owners, you keep the car four years, you can average out depreciation on a Big-Three V-8 to about \$430 a year. On a lower-priced import it should be considerably less, though with new American-made small cars coming, it is impossible to forecast what even the redoubtable VW will be worth four years from now.



FOUR FIAT TAXIS his this average 25 to 30 miles per gallon in stop-and-go driving, the operators report. Clutch repairs were needed and tires recapped at about 30,000 miles.

Depreciation, like taxes, will always be with us. But the economy car does smooth some rough edges off it.

Small one-time savings show up in price. Freight and preparation charges for an economy car are somewhat more modest than on big cars. Many, though not all imports, include a heater as standard equipment. A few even throw in white sidewall tires.

On lower-priced models you naturally pay less Federal and sales tax, and smaller interest charges. But these savings dwindle as you climb the price scale. On the four-cylinder "compact" cars you could pay as much as on a sixcylinder domestic model.

The gas economy of the small car is generally conceded even by die-hards in the big-car camp. Small four-passenger sedans deliver up to 40 miles per gallon. Some of the bigger "compact" fours get only 22 in overall highway and city driving. But compare this with the 13.5 miles that Runzheimer and Company, Inc., fleet-managing consultants to many carusing companies, find average for a 1959

#### A 100,000-mile cost record on a Hillman Minx

In 1953 Malcolm Miller, of Knoxville, Tenn., bought a new Hillman and proceeded to drive it for 100,000 miles, far beyond the point at which experts advise trading. At right is his record of what he spent on the car.

The original English tires were recapped at 60,000 miles, discarded at from 76,000 to 97,000 miles. Tire costs shown include puncture repairs, recapping, and the cost of new replacements.

Maintenance and repair costs include needed body work, a complete paint job, washing and polishing. The yearly depreciation shown is based on a 76.1 percent loss over five years. Interest, not shown in the owner's record, is an assumed average over the five-year period.

	<ul> <li>Actual cost</li> </ul>	Per mile	
Mechanical work	\$ 695.22		
Body work	128.56		
Lubrication	105.44		
TOTAL MAINTENANCE	\$ 929.22	.9294	
Gasoline 4,211 gallons	\$1,192.96*		
Engine oil 348 quarts	160.33		
TOTAL GAS AND OIL	\$1,353.29	1 353g	
All tire costs	171.13	.171¢	
TOTAL VARIABLE COSTS	\$2,453.64	or 2.453¢ per mile	
All insurance, annually:		\$136.57	
City and state license, annually:		21.73	
Depreciation (annually, over five years):		280.00	
interest (everaged over five years):		26.25	
TOTAL FIXED COSTS:		\$464.55	
Fixed costs per mile, at 20,000 miles annually:		2.322¢	
TOTAL OF ALL COSTS PER MILE:		4.775¢	

Ford V-8 in heavy-traffic city driving.
As you would expect, our domestic sixcylinder cars lie between the V-8s and
the four-cylinder imports in economy.
Runzheimer fleet studies credit the Rambler American six with 18 miles per gal-

lon in metropolitan traffic.

A commuter who covers 24 miles to and from his railroad station daily, and whose wife travels even farther on family errands, used 781 gallons of gas in a 1957 Chevrolet and a 1940 Pontiac over a 12-month period. Keeping the Chevy, he replaced the Pontiac with a Fiat 600. In the following 12 months he used 614 gallons, a saving of 167 gallons, or \$50 at 30 cents per gallon.

The insurance agent, who saves his Cadıllac for long hauls, does about 250 miles of stop-and-go driving weekly in his 4CV on two dollars worth of gas. His big car burned eight dollars worth for

the same mileage.

Getting down to business. A division manager of Otarion Listener Corporation of Ossining, N. Y., makers of hearing aids, was paid seven cents per mile for using his own big car in California. In a 9½-month period he received \$672 for 9,607 miles of travel, an amount he found did not cover his operating costs and depreciation.

The company bought a Kharmann Ghia for his use. In the same period for 1958 he drove it 12,146 miles, spending \$138 for gas, \$58 for servicing, oil and repairs, and \$21 for storing, parking and cleaning the car. This comes to under 2.3 cents per mile, to which must be added depreciation, insurance and license costs. But the saving was dramatic.

In Rockville Centre, N. Y., the Weeks Moving and Storage Corporation provides its estimators with Renault Dauphines. Records of three of these show that one delivered only 30.7, another 33.4 and the third 40 miles per gallon. Despite this variation, all show substantial savings over cars previously used.

You'll save at the gas pump with an economy model, but the big difference shows up only if you cover lots of miles. The 3,500 mile-a-year owner may pocket

[Continued on page 212]

#### **PS Picture News**





BIG AIR TERMINAL.

Miami's new air terminal building, said to be the world's largest under one roof, will be opened this winter at its 2,878-acre International Airport, The building, designed in the shape of a huge arc left), is 3,000 feet long, cost \$21,000,000 to construct. An adjacent parking area will handle 5,000 cars. Planes, including jets, have runways up to 9,400 feet with room for expansion to 11,200 feet.

82 POPULAR SCIENCE AUGUST 1959



"rock oil" Drake's backers meant to exploit that their 1855 stock certificates bore this conception of the work. The engraving illustrated the company's intention to "bore, dig or mine" for the petroleum. Just 100 years ago—hard work, ingenuity, and some pretty weird machinery set off The Great American

# 

HIS month the oil industry celebrates its centennial. Just 100 years ago the first commercial oil well was brought in near Titusville, Pa. In that backwoods village in August, 1859, began a boom that was to afford men the greatest opportunity of the century—perhaps of all time—to strike it rich.

Pennsylvania's '59ers did not even have to travel far. The oil country was on the very doorstep of the populous East. Drilling rights were obtainable for a few dollars and a share in the prospective oil. Wells could be sunk with

THE WELL THAT STARTED IT. In this photo taken by John Mather in 1861, Edwin L. Drake (with beard) stands near the well be brought in in 1859. Though never itself a big producer, it sparked the great oil boom.





MYSTERIOUS OIL PITS near Oil Creek may have been the work of a race preceding the Indians. Roots of 300-year-old trees running through some of the 2,000 pits testify to their age. Log cribbing is half-lapped at the joints, a construction Indians did not use. The oil seeped up inside the pits to form storage pools.



ROCK OIL PUMPED UP by salt wells was considered a nuisance and dumped in a nearby canal. One day in 1845, a boy threw a torch into the water. The oily surface burst into flame for hundreds of feet. The incident furnished dramatic proof that the despised stuff was good for something: It would burn with enthusiasm.



tiger ay the tall. When Sillman called the oil a valuable raw material, a company formed to exploit it sent Edwin L. Drake to Titusville. Finding the land a pool from which only a few gallons a day could be skimmed, he had a well dug to tap a more generous supply. But inrushing water almost drowned the diggers.



the rudiments of cable drilling. Told by his backers to abandon work, Drake used his own credit to buy a "Long John" steamboat-type boiler and a six-hp. engine. His derrick was made of four 30-foot poles, set 12 feet apart at the bottom and three feet apart at the top.

primitive tools and muscle power. Millionaires were made by sweat, persistence and a modicum of luck.

The sticky, bluish-green gunk from the earth was to prove more potent than gold. From a mere spark in the newfangled kerosene lamp (which ran the great whaling ships off the map), oil was to become the life blood of the horseless carriage, the wing beat of the Wright Brothers' original flying machine, the sinews of motorized warfare and the power of today's jet-age planes.

Crude oil seas known to the ancient Chinese and in the Near East. In this country, the Indians used it as a medicine. But there is evidence than an even earlier race, the mound builders of the



bottled the black gunk from his father's salt well as a remedy for man and beast. Sensing its value as a lamp fuel, he set up a one-barrel still in Pittsburgh in 1851. So popular was his pale yellow "carbon oil" that he soon enlarged the still to make it a five-barrel producer.



Oil TOOK A GIANT STEP ANEAD when Dr. Francis Brewer took a sample from his father's farm to Dartmouth University. Young George Bissel saw it and in 1854 engaged Prof. Benjamin Silliman Jr., of Yale, to analyze and evaluate it. In a kitchen lab, Silliman broke down the crude petroleum into its various fractions.



THE FIRST USE OF CASING occurred when water flooded the wooden conductor pipe in which the drill worked. Drake then thought of driving east-iron pipe to the first rock layer 32 feet down. On Saturday, August 27th, the drill stopped at 69 feet. Sunday morning, driller William Smith discovered that there was oil in the bore.



THE BOOM WAS ON. William Barnsdall, a shoe-maker, drilled on a relative's farm near Drake's well. Mounting a hickory pole on a post, he hung the drilling tool from the springy end and "kicked down" the well to a depth of 80 feet by jumping on stirrups. He brought in the first of the wells that followed Drake's success.

Mississippi Valley, collected it in pits dug for the purpose.

By 1807 white men were collecting it by the even more primitive method of the redskins—skimming it off pools and creeks, or soaking a cloth in the oil scum and wringing it out. Called Seneca or Genesee oil, the black stuff was sold as a cure for "rheumatick pains." A Pittsburgh man named Kier was farseeing enough to seek other uses for oil. He set up a still to refine it for lamp use, so becoming the first refiner. A cheap lamp oil was badly needed. So were lubricants for the multiplying wheels of the industrial revolution.

The first oil well was drilled by an ex-railroad conductor, Edwin L. Drake.

Deserted by his backers, he struck oil at the providentially modest depth of 69 feet. The boom was on as alert villagers staked out drill sites.

Many a man "kicked down" a well to riches with a drill tool suspended from a springy bough and driven up and down with his own leg muscles. Speculators, gamblers and land sharks poured into little Titusville. Teamsters and coopers amassed fortunes hauling oil and building barrels to hold it.

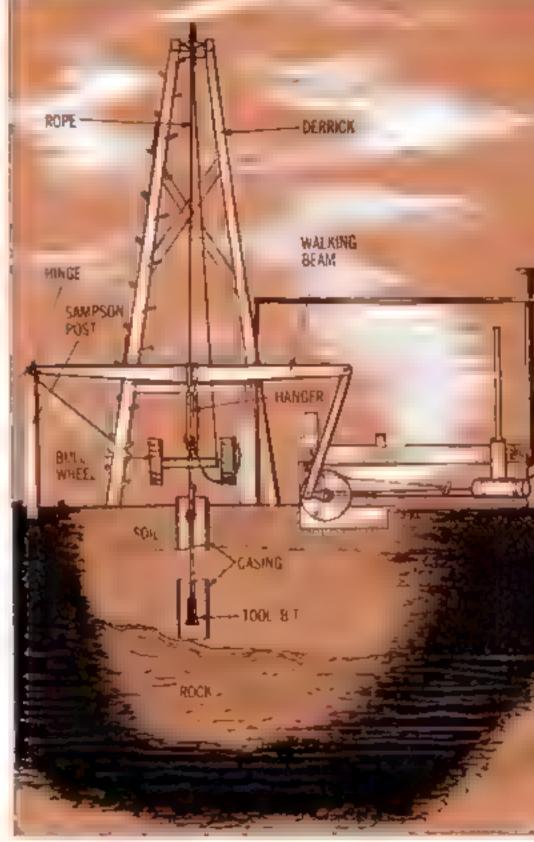
Gushers came in as wells were drilled deeper, to 400 feet or more. spouted three to four thousand barrels a day. Such overbundance almost brought disaster. In 1861 the price fell. dropped to 20, 15 and even 10 cents per 40-gallon barre!

Some freak wells flowed for so many minutes, stopped for a time, and then spouted again, all to a rigid schedule. But eventually gushers subsided and oil had to be pumped up.

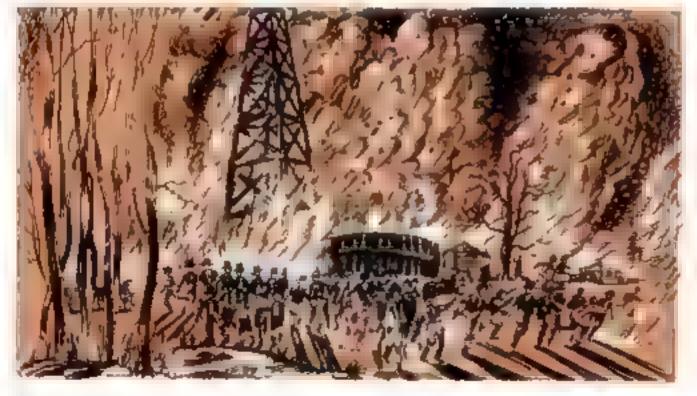
Torpedoing oil wells to restore their flow was the idea of a Union officer. Colonel E. A. L. Roberts. In 1865 he first exploded a gunpowder charge in a well. Later he learned to use nitroglycerin. The practice became common. spiced with patent fights, lawsuits, and picturesque "moonlighters" who torpedoed wells by night to avoid paying Roberts his rovalties.

Lethally sensitive, nitroglycerin was brought to the well by horse and buggy, accompanied only by the shooter. Engaged in perhaps the loneliest work in the world, he poured the "shot" down the casing.

If all went well, he was rewarded with



DRAKE'S DRILL RIQ was patterned on those used for driving salt wells. A heavy chisel-edged tool bit lowered into the casing was raised and dropped by a walking beam linked to the engine shaft, pulverizing the rock. To remove water, mud and chips, the tool was horsted out by a bull wheel and a sand pump or bailer lowered.



THE FIRST GUSHER WAS the Buchanan well, near what is now Rouseville. On an April evening in 1861, it began spouting a great column of oil As a hundred people watched the marvel, fire in a nearby boiler ignited vapor-laden sir. The gusher became a tower of flame. Even the ground burned. Nineteen men died.

#### His camera caught oil boom's highlights



WHAT Mathew Brady did for the pictorial his tory of the Civil War, a young Englishman named John Mather did for the Pennsylvania oil rush. After learning from an itinerant photographer the new art of the camera—with its clumsy wet

plates—Mather heard of Drake's well and headed for it.

He stayed in the oil region all his life following the big strikes from town to town. The photos in this article are from his files.



Oil WENT TO MARKET by wagon, flatboat and river steamer, but most spectacularly on the spring treshet. Upstream dams were thut, oil loaded on whatever would float, and the water loosed to sweep all before it. In 1864 a boat lodged against a bridge pier at Oil City (above). The stupendous jam caused great loss.



WHEN THE RAILROAD CAME, oil barrels were shipped as on this train photographed near Rouseville. Amos Densmore in 1865 devised the first tank cars, putting two round 45-barrel tanks on a flatear. So profitable was the Oil Creek Railroad that it paid 25 percent in its first 14 months, as high as 53 percent later.

high pay and a three-day headache from nitro fumes. But mortality among shooters was high.

Pipelines came along as early as 1865, when bad roads, high teamster charges, and oil flowing faster than it could be taken away inspired an oil buyer to build one. Samuel Van Syckel laid five miles of two-inch pipe that moved 80 barrels of oil per hour. This first pipeline sparked not only others like it, but a long, bitter feud with teamsters.

Among all the fabulous gushers, no well created more wonder than one described by Hildegard Dolson in her book



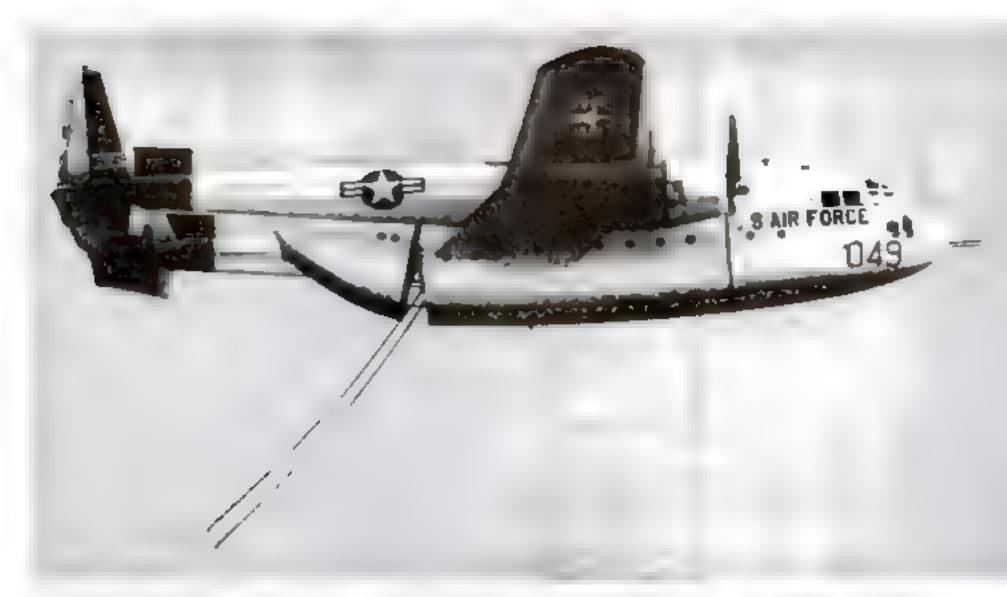
FIRE AND FLOOD engulfed Titusville in June, 1892, when a dam broke after heavy rains and a refinery caught fire. Storage tanks blew up. The hurning creek carried the fire to Oil City, killing 125 persons. Mather took this photo of the disaster—a holocaust that would strike at him: In it, he lost 16,000 negatives.

The Great Oildorado. The driller of a hillside well, feeling the bit drop through the rock it was drilling, sent down the bailer. It brought up a foamy amber fluid like beer.

It smelled and even tasted like beer. Astounded visitors came to sample it and to toast the driller who had struck something better than oil. Last to come was a red-faced German.

"Gott im himmel!" he roared. "You haf broke into Grossman's vault!"

Grossman, a brewer, kept his product in a cave under the hill. The drill had broken into a tun of beer.—Harry Walton.



AIR SNATCH. Here's the Air Force's newest method of recovering missile capsules in flight. The Fairchild C-119 above was specially modified to handle the recovery gear, shown at right with a snared practice capsule being reeled in by winch. The drawings at far right show how the device works: With trapeze-like equipment let out through the cargo hatch, the plane overtakes and snatches a parachuted capsule and pulls it in. The equipment was designed for the recovery of capsules retro-rocketed from orbit on a re-entry trajectory, as part of the Discoverer program.



WIRE-LAYING COPTER. Twin dispensers on the side of this whirlybird make combat-communication wire laying swift and easy. Signalmen splice reels (1), load them in the dispensers (2), make ground connections (3) before takeoff, and fly with reels unwinding at 60 m.p.h.

#### **PS Picture News**





Each reel contains a half mile of wire, and a helicopter carries 200 reels. GIs in the 101st Airborne Division at Fort Campbell, Ky., thought up the idea. Earlier flights had a four-mile limit with a wire-paying jeep or mechanical mule slung under the bird. It's all the wire the vehicles can carry.

# Lied to a



Photos by Robert Austin.

#### By Wesley S. Griswold

I STOLE a wallet, right under the noses of the Los Angeles police. In fact, a tall, grinning sergeant watched me do it.

The wallet was crammed with stage money—\$510 in make-believe bills. I swiped it as part of a conspiracy with the sergeant to see if I could fool a lie detector. The plot failed, The lie detector, whose proper name is polygraph, caught



KEEPING TRACK OF EMOTIONS, the three styluses of the polygraph write the record of the author's instructive reactions to questions. The graph paper moves at six inches a minute.

me cold in the only lie I told. Here is how it happened.

From reading scores of crime stories in Los Angeles newspapers, I had long been aware that the local police frequently give lie-detector tests to suspects, witnesses and surviving victims—when they can get the individual's consent.

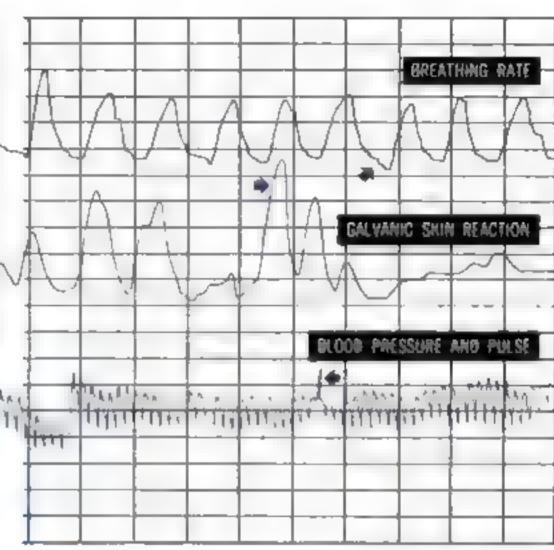
This struck me as curious, for I knew that California law does not permit the result of a polygraph test to be used as evidence in court—except on the rare occasion when defense, prosecution and judge all agree on it in advance. Most states are as stern as California in their skepticism about lie detectors.

Why, then, I wondered, does the Los Angeles Police Department, widely known for its devotion to scientific methods, persist in consulting this legal outcast, the polygraph? Is the gadget more reliable than the law will admit? How does it work? How sensitive is it? Can it be deliberately deceived?

With these questions in mind, I arranged to get acquainted with a lie

# Lie Detector

THE FIBBING AUTHOR (far left) gazes at a blank wall in Los Angeles Police Headquarters while Lt. George H. Puddy, operating a he detector, notes telltale record of a falsehood. The evidence of a lie is indicated by arrows on this strip of graph paper. The peak in the middle line is the galvanograph's record of the author's unconscious rise in tension as he prepared to fib. The sharp blip in the bottom line shows that his heart made a little leap. The quavery downstroke in the top line is the track of a sigh of relief that the lie was over.



detector at the handsome new police headquarters.

My conspirator there, the sergeant, first asked me to choose one box from a pile on his desk, and take what was in it. The box I picked contained a wallet.

"Count the fake money in it before you put it in your pocket," the sergeant said. I did so.

"Now," he said, "I'm going to turn you over to our chief polygraph operator, Lt. George H. Puddy. He's assistant commander of the Scientific Investigation Division. I'll tell him you've stolen a wallet, but he doesn't know how much money is in it, and you're not going to tell him. However," he added, with a wink, "he'll find out!"

That's pretty unlikely, I thought. The sergeant led me through a series of doors to a plain little room deep inside the building, far removed from distracting sights and sounds.

The remote room we finally entered had bare brown walls and very little furniture. There was a straight chair, with



MOST SENSITIVE INDICATORS of the emotional flurries that accompany lying are very often the polygraph's electrodes. They register nerve tensions that make the subject's fingers sweat.

elongated wooden arms. Beside it stood a steel desk. There was a rectangular opening in the top of the desk, and some knobs and a rubber bulb next to the opening, which contained a strip of graph paper with three styluses resting on it. The desk had a chair, and in one corner was a coat rack. That was all.

#### Actual criminal cases show how lie detector aids cops



Who killed the Black Dahlia?

The murderer of this unfortunate girl, whose weirdly mutilated body was found in a vacant lot in Los Angeles early on the morning of Jan. 15, 1947, has never been caught. Yet at various times since then, 37 men have confessed to the killing. The polygraph has clearly demonstrated that every one of them, for incomprehensible reasons of his own, was lying. Investigation confirmed its findings.

A recent lurid case in which the polygraph figured importantly was that of Mrs. Elizabeth Duncan, of Santa Barbara, who was found guilty of having hired a couple of Mexican laborers to murder her daughter-in-law. The testimony of two key witnesses in an early stage of the case, when the victim was known to be missing

but not to be dead, was seriously questioned by investigators. One witness, an aged lady, was thought to be imagining things. The other, believed to be telling the truth, was lying. The polygraph proved the first was a dependable witness, and so exposed the other's lies that she confessed to them. The case thereafter quickly developed as one of murder.

On another occasion, a middle-aged Los Angeles barfly was found in a remote glen with her head bashed in, and seven men were under suspicion. The polygraph helped eliminate all seven and pin the blame on a previously unsuspected eighth, who was the actual murderer. Unnerved

by the polygraph, he admitted it.

The lie detector also has had its lighter moments. Not long ago, it gave Los Angeles police unmistakable evidence that a burglary suspect reacted with strong emotion whenever cherry pie was mentioned. When this fact was revealed to him, he looked dismayed, and admitted his guilt. He had made the mistake of leaving his trademark behind. Somehow, he couldn't resist eating his favorite food whenever he found it on premises he was burglarizing—cherry pie.

I hung up my coat and sat down on the straight chair. Lt. Puddy walked in. He was a husky, genial, middle-aged man with the quiet cultivated voice and manner of a professor.

He explained that he knew I had the wallet. He was going to ask me a series of questions in an attempt to find out how much money was in it. I was to answer "No" to each question, whether that was truthful or not, and say nothing more.

I was to sit up, Lt. Puddy said, look straight ahead at the blank wall, avoid crossing my legs and, in fact, make no movements at all.

The lieutenant then rolled up my left shirtsleeve and fastened a conventional blood-pressure cuff around that arm.

"This will record your pulse and, of course, keep track of your blood pressure," he said.

He next hooked a length of corrugated rubber hose around my chest. "That's a pneumograph," he explained. "It records the rate and manner of your breathing."

Then he slid two ringlike electrodes over the first joints of two fingers of my right hand, and plugged a nearby cord into a wall socket.

"Now there's a very tiny electrical

current running through you—just a few millivolts," he said. "You can't feel it. But the amount of nervous tension in your body that will make your palms or fingers sweat will cause a temporary short circuit in the current, A galvanometer in the polygraph will register the short and one of the styluses will draw a peak on the graph paper."

Lt. Puddy returned to the desk, sat down and asked me if I was ready. I said I was. He squeezed the rubber bulb a few times, causing the blood-pressure cuff to grip my arm. Then I heard the whisper of the graph paper as it began to

roll under the inked stylus,

"Did you take approximately \$200 from the wallet?" he asked softly.

"No," I said, in an unfamiliar voice. "Did you take around \$300 from the wallet?" he asked, in the same low tones.

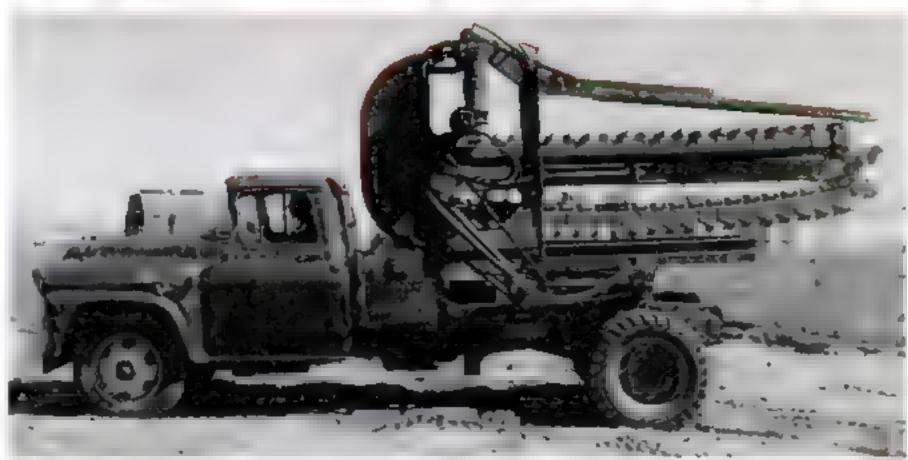
"No," I said, more firmly.

On went the questions, raising the sum of money \$100 each time, and on went the negative responses—until there had been seven.

Then Lt. Puddy looked up with a smile. "That's enough." He came over and released me from my chair.

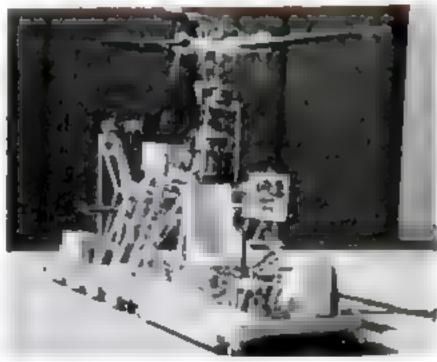
[Continued on page 216]

#### What Does This Truck Do?



For sequence photos of the unusual rig in action, turn page





CUTAWAY COPTER. Army mechanics learn how Bell's HU-1A jet helicopter works by studying a full-size model. They watch parts move inside the rotor hub, gear boxes and transmission through glass windows.

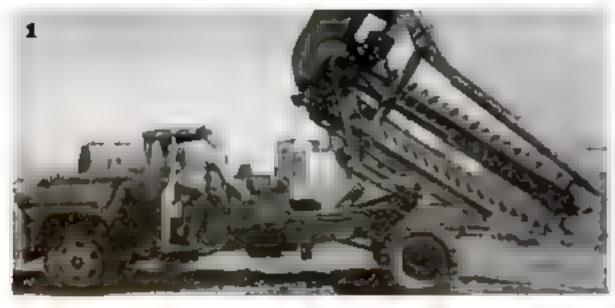
Bunyan could rest his head on this largest "pillow" in the world, Goodyear made the 24- by 64-foot rubber-coated nylon tank to hold 50,000 gallons of fuel oil or other liquid. Empty it weighs one ton, rolls up.

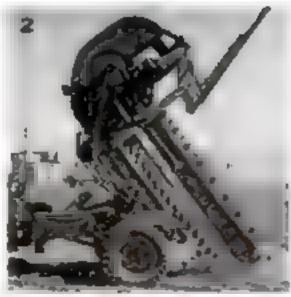


STAIRS FOLD INTO PLANE. This Viscount airliner needs no boarding ramp—it carries its own stairway inside. The steps, made of light metal alloy, are hydraulically folded like a Venetian blind into a small space inside the plane.



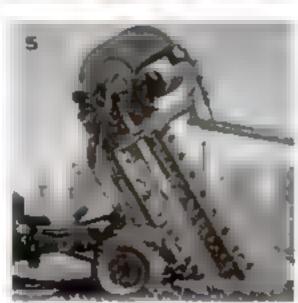
#### Here's what the Earthripper can do in three minutes





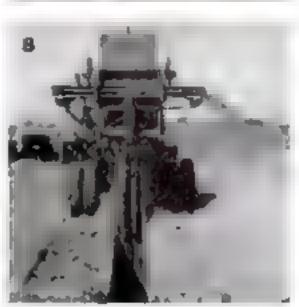












EARTHRIPPER is the fastest, neatest mechanical ditch digger in the world, the maker claims. Ready to dig 30 seconds after it leaves the road, the machine tilts backwards and claws its own hole in the ground. Without extensions it can burrow 9½ feet straight down; with them it goes 12 feet deep.

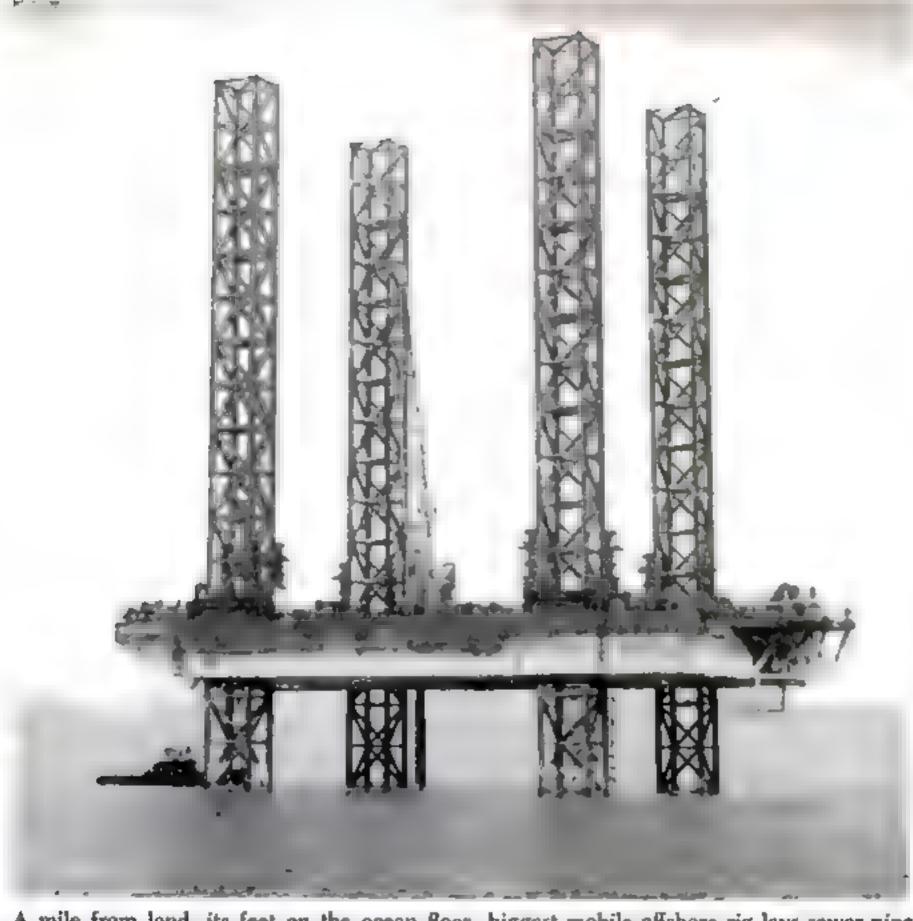
Once the toothed buckets have chewed their way to the desired depth, the truck gets underway. It pulls Earthripper's buckets along with it, quickly extending the hole into a ditch. At a trench depth of six feet, for example, the rig moves 23 feet a minute. If the buckets start to bite into buried pipes or cables, a slip clutch temporarily disconnects power to prevent damage to the under-

ground installations and the machine.

Dirt scooped out can be spewed to either side of the ditch at whatever rate the operator wishes, independently of the digging speed. In one minute, under ideal conditions, Earthripper digs up 170 cubic feet of dirt—it could fill a gondola railroad car in less than 15 minutes.

The designer and builder of Earthripper is C. W. Pewthers of Bryan, Tex. Pewthers built a successful rubber-tired ditching machine in 1946. This latest one is radically different, however.

Buckets and their supporting boom are hydraulically powered. The boom can be positioned to dig in any direction —down, at an angle, even straight back into a vertical bank.



A mile from land, its feet on the ocean floor, biggest mobile offshore rig lays sewer pipe

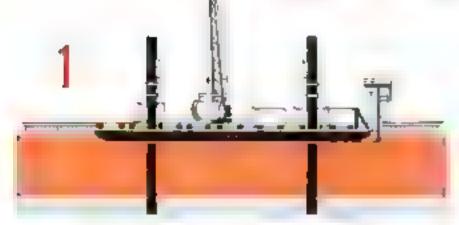
## Giant Pipe-Layer Walks on 275-Foot Legs

When hydraulic legs are drawn up, platform can be towed or winched to a new location

GIANT ocean-going work platform with four huge legs of steel, each 275 feet high and 17 feet square, is now the oddest sight in Santa Monica Bay, Cal. On those great legs, the platform can lift itself high above the waves. It can either stand firmly in water more than 200 feet deep, or lower itself until it floats.

This 4,500-ton mobile platform, christened the George F. Ferris, is said to be the largest of its kind in the world. It is busily engaged on a job that has never been done before. Using cranes and winches, it is setting a mighty pipe on the

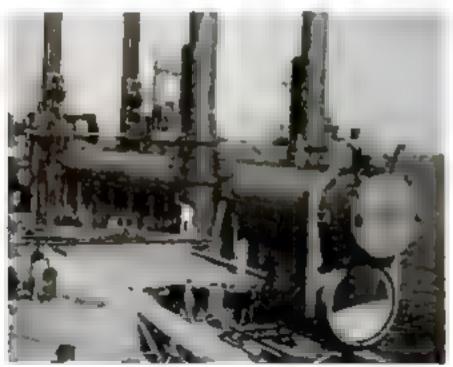
#### How giant work platform lays pipe on the ocean floor



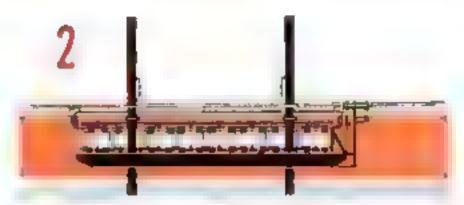
SECTIONS OF PIPE are assembled on a dry dock at Long Beach, in units of six sections.



LITTLE MAN, WHAT NOW? This monumental section of pipe is 24 feet long, 12 feet in diameter. Eight sections compose one unit in the system.



PONTOON AND PIPE UNIT are launched at Long Beach. Lashed together, they will be towed to the work site off El Segundo, 30 miles away.



DRY DOCK IS SUBMERGED so that pontoon can be maneuvered by cranes to position over pipe.

ocean bottom. Mostly 12 feet in diameter, it will reach out into the sea for nearly six miles. Toward its end, the pipe will branch out in two long, slimmer arms for a few thousand feet more.

Each unit of the main pipe is 192 feet long and weighs more than 600 tons. When fully assembled, some time next year, the pipeline will carry discharge from Los Angeles' main sewage-treatment plant at El Segundo into deep, distant water, where it cannot contaminate bathing beaches.

Sections of pipe for the George F. Ferris to lay on the floor of the bay off El Segundo are made on the waterfront at Long Beach, Each section is 24 feet long. Eight of them are fitted together, lashed to the bottom of a 212-foot pontoon and towed north 30 miles to the work site where the pipe-laying platform takes over.

Lines from winches mounted on traveling cranes at the platform's bow and stern are fastened to hooks at both ends of the pontoon. These lines move the pontoon forward, backward and sideways until its position is precisely right. Then the pontoon is partially flooded, and let down through the water until the pipe is within one foot of the bottom. Pontoon and pipe are then winched along until the pipe forms a joint with the unit previously laid.

The pipe must never deviate more than five feet from a straight line. To avoid errors in fog or storms, exact positioning is done by triangulation with microwave apparatus. An instrument called a Tellurometer transmits continuous microwaves on a frequency of 3,000 megacycles. Two receivers on shore, one on each side of the pipeline, receive the impulses and relay them back to the transmitter. The time it takes for the

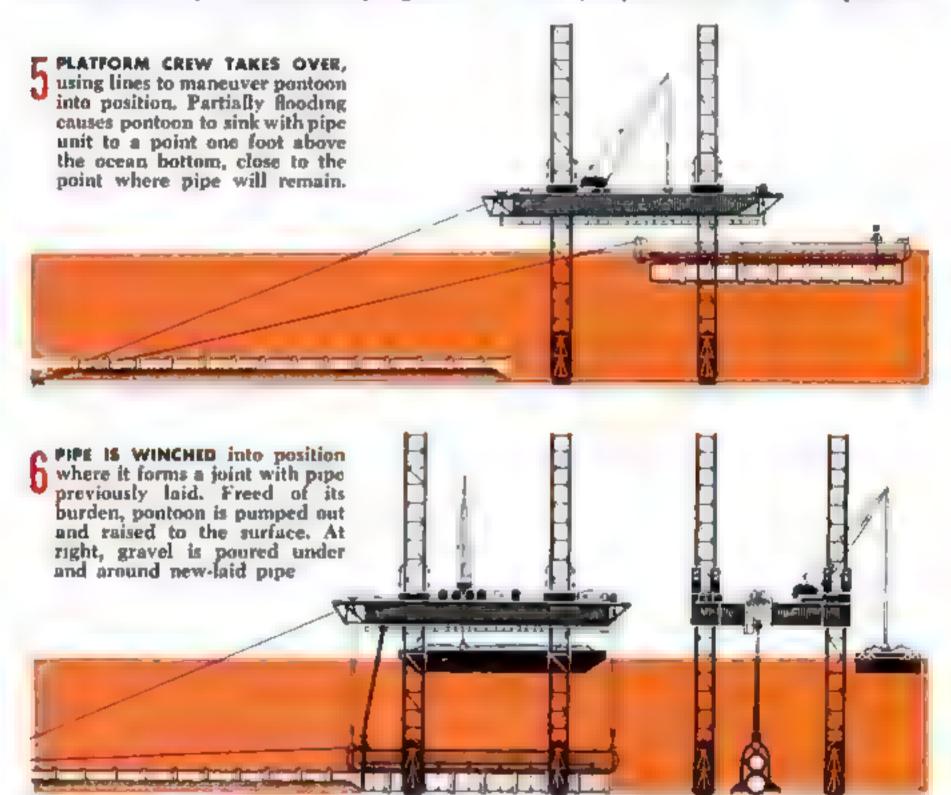
#### as it wades the six-mile route of novel sewage-disposal system



PONTOON AND PIPE are lifted by dry dock to surface where they are lashed firmly together.



PARTIALLY SUBMERGED, with pipe assembly under water, the pontoon is towed to work platform.



microwaves to make a round trip is an exact measurement of the distance

As the pipeline moves into deeper and clearer water, the jointing process will be watched from the platform by means of closed-circuit television with cameras mounted on the sunken pontoon.

After the joint has been made, a telescopic pipe reaches down, like an elephant's trunk, and is connected with a pair of chutes, on rails, that straddle the sunken pontoon. Then, as the crane travels slowly along, gravel from hoppers on the platform is poured down this pipe and through the chutes, forming a snug cradle for the sewer pipe.

When that job is done, the pontoon is released from its burden and brought to the surface. Pumping it out gradually on the way up prevents it from popping out of the water. It is then ready to go back for another load of pipe.



NO DECK GAMES aboard the offshore rig George F. Ferris. Much of the available space is taken up by huge gravel bins, filled from tug-drawn barges. Also on deck are traveling cranes, tractors and other goar for laying 192-foot sections of sewer pipe, weighing 600 tons per unit, on the ocean's floor. At some points this is more than 200 feet beneath the surging surface.

Once a section has been added to the lengthening conduit on the ocean floor, the George F. Ferris lowers itself into the water, lifts its ponderous legs off the bottom and is all set to float to the next location. It climbs up and down its box-girder legs by means of powerful hydraulic jacks, whose horizontal pins fit into square notches along the flanges of the girders. The action, on a grand scale, is much like that of an automobile jack.

In the base of each leg is a large pontoon which provides a broad, flat foot. This pontoon makes it easier for jacks to lift the leg when it's time to move. Once afloat, the platform hauls itself ahead by pulling on forward anchor lines and paying out the lines to its stern anchors. It will have to go through this "walking" process 170 times before its job in these waters is done.

The George F. Ferris was towed 450 miles down the coast from Richmond, where it was built. It had to lower its legs slightly to duck the Golden Gate Bridge, then lift them to their full height to avoid a sandbar. But there was nothing brisk about this process: The platform's legs are jacked up or down at a speed of 40 feet an hour.—Wesley S. Griswold.



SCARDING NET, along over the starboard side, enables crewmen returning from shore leave to climb aboard their strange ship, which, in this photo, is standing on the ocean floor.

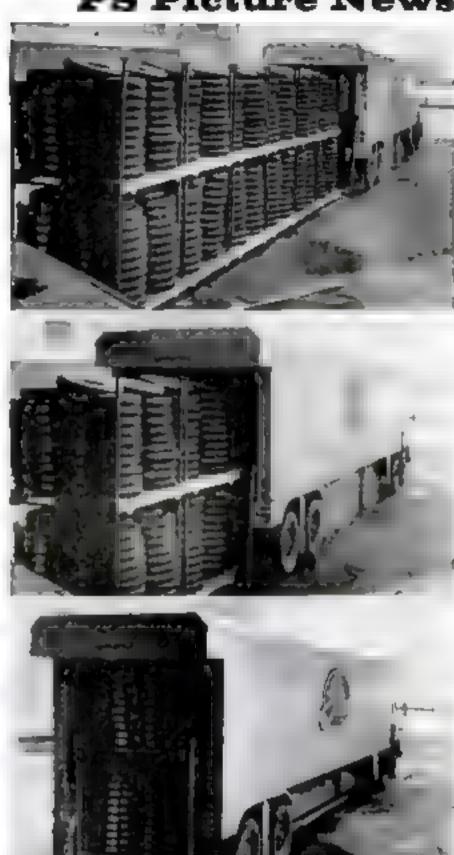


SEA LEGS DRAWN UP, the George F. Ferris barely clears the Golden Gate Bridge in San Francisco Bay on her maiden voyage to ber work station. An ocean-going tug provides power,

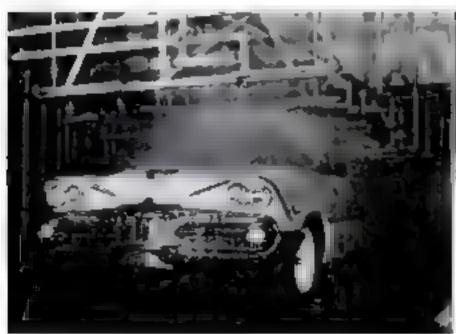
#### **PS Picture News**

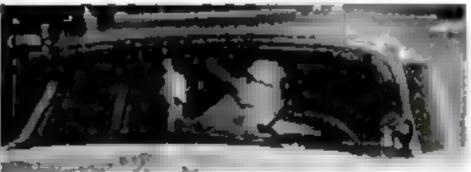


ON TARGET. These striking movie frames of a direct hit by a British Bloodhound surface-to-air guided missile were taken by a camera on the wing tip of the destroyed target drone. The camera was parachuted to the ground after the hit.



BIG MOUTH. Here's a truck trailer that swallows its load. The big vehicle, made by Straddle Trailer Corp. of Denver, is shown, top to bottom, with hydraulic-controlled side shelves down, backing on a load and with load in place.





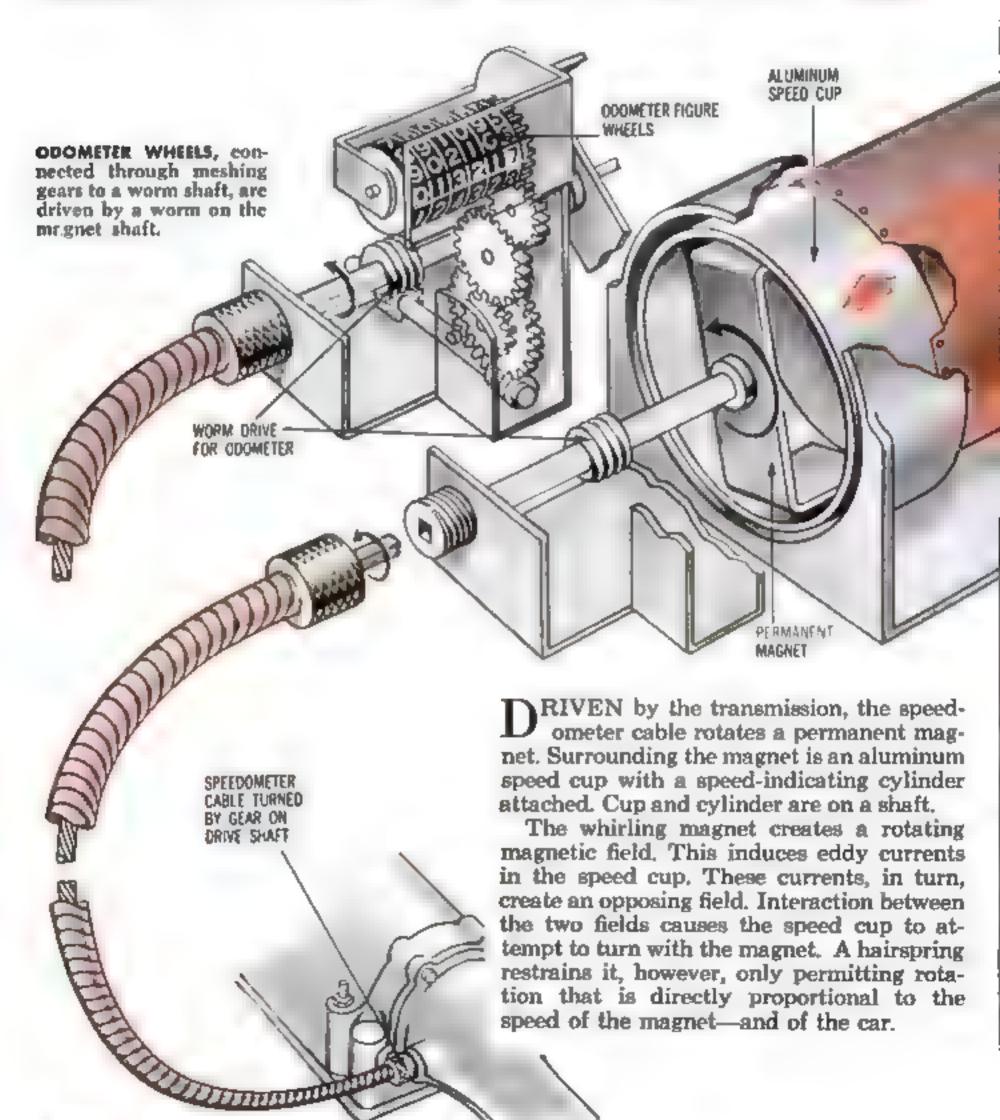
CAR DUNK. The new Dodge at left gets a shower at the rate of 15½ feet of water an hour sprayed at 30 pounds' pressure from all angles. Above, a factory inspector, flashlight in hand, examines seals at the windshield for leaks.

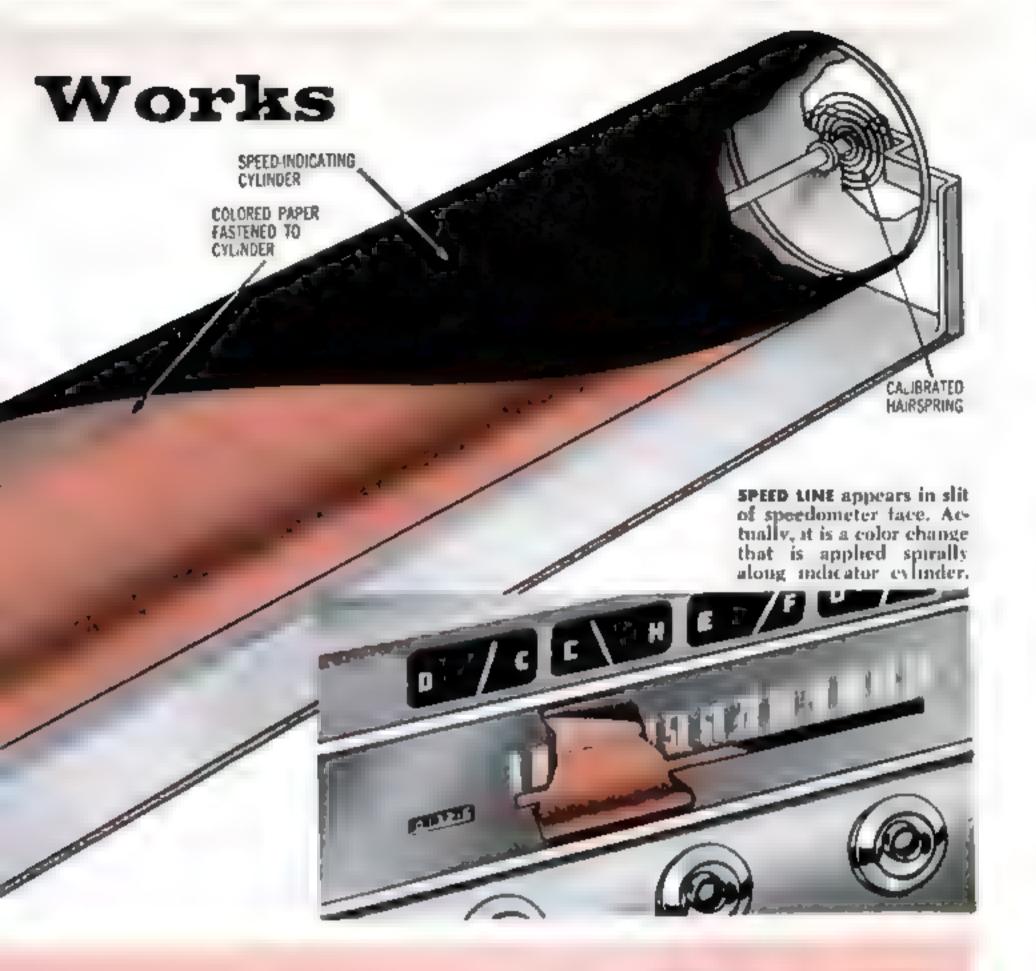
### How a Speedometer

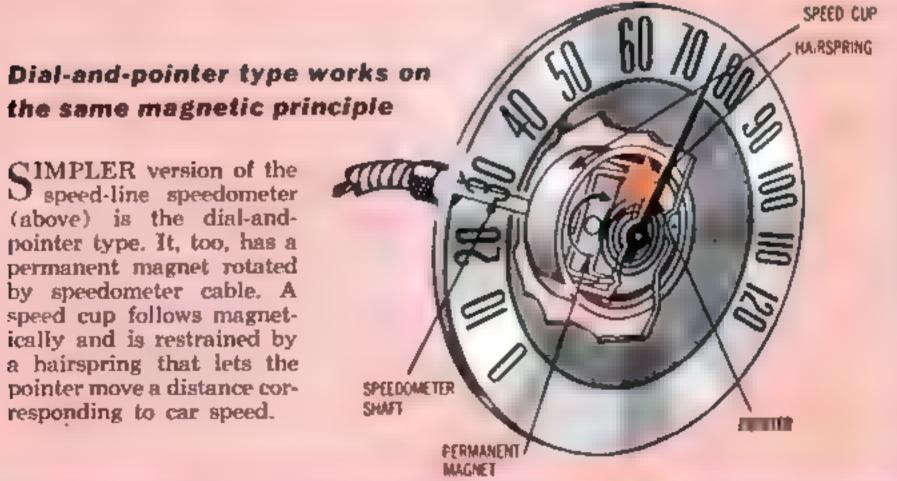
SPEEDOMETERS have been on automobile instrument panels for over 50 years. And during most of that time they've changed little. One early change shifted the driven end of the cable from a front wheel to the transmission. More recently, some cars have sported a speedometer with a horizontal "speed

IOD POPULAR SCIENCE AUGUST 1959

line," rather than the pointer on a dial Despite outward differences, speed ometers all make use of the magnetic principle described below. They have something else in common: By S.A.E. standards, speedometer cables in American cars are now geared to make 1,001 r.p.m. at 60 m p.h.—Erik H. Arctander.









TAKEOFF ORDERS for the aerial tanker fleet come to mobile headquarters by radio.



LOCATION OF FIRE is pinpointed on an operations chart; direction, distance noted.



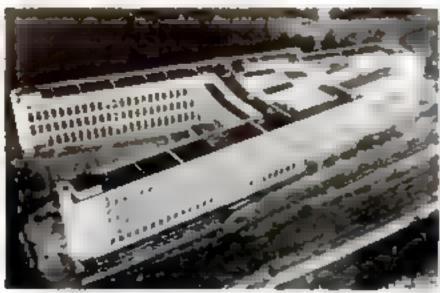
POWDERED BORATE and other chemicals are dumped into hopper, water hosed into mixture.



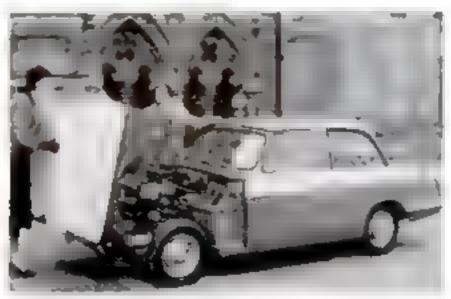
SLURRY TANK HOLDING 1,250 GALLONS protrudes from belly of a loaded B-25 bomber.

#### "Air Raid" on a Forest Fire

VETERAN hedgehoppers in the Los Angeles County Fire Department form an Initial Attack Group to protect forests. They douse trees with flame-retarding slurry at the start of a fire. The slurry, a gravy-thick mixture of sodium, calcium and borate in water, gives trees and underbrush a sticky coating that just won't burn. Spread from low-flying planes, it fireproofs an acre an hour.



PEACE SPEARHEAD. The just-completed headquarters of the North Atlantic Treaty Organization in Paris is symbolically designed as the point of a spear. Its basement will park 500 cars.



FRONT-HINGED HOOD. Britain's new small Triumph Herald—earmarked for export to U.S.—permits full access to its 38.5-hp. engine with a hood opening forward. It comes as a sedan or a coupe.

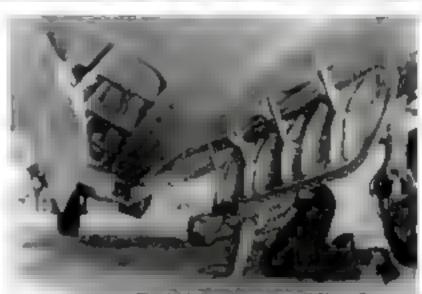


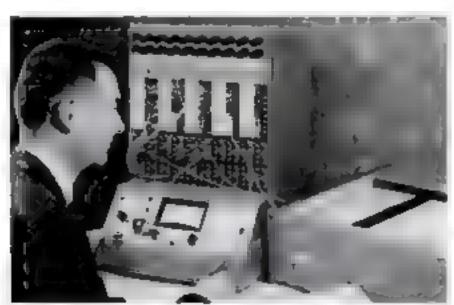
TORPEDO SOMBER takes on load pumped through hose into its 600-gallon tank. Other planes in fleet include PBY flying boats converted into fire-fighting tankers. Some carry multiple tanks, dumped one at a time or all together. Delivery capacity has peaked at 17,550 gallons an hour to smother burning timber.



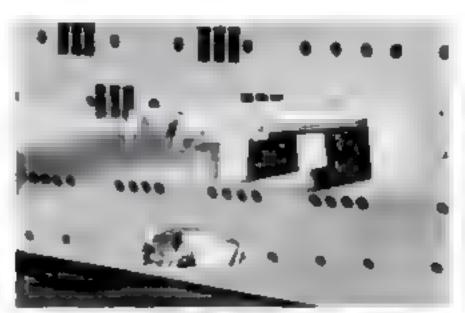
tons of sturky cascade down from triggered belly doors of a torpedo bomber flying low over the trees. It blankets fire before it can get out of control.

mission completes, plane is hosed down. Here, a fire-fighting pilot inspects PBY's after tanks to be sure no traces are left of the heavy borate slurry.





DESK-TOP COMPUTER. This little analog computer measures 15 by 17 inches at its base. It is built by Electronics Associates to do engineers' everyday computations with high accuracy.



CAR LOADER. Britain's 45,000-ton liner Canberra has a hoist on rails for direct loading into a 60-car garage in the hold. Purpose: To make passengers' cars easily available at ports of call.

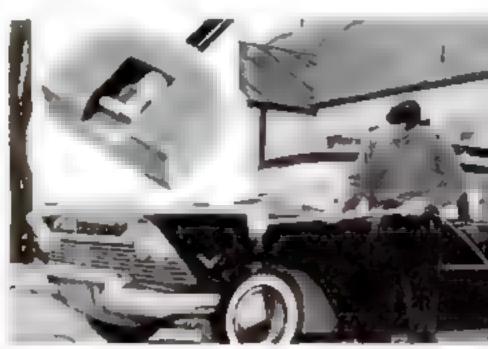
#### WHAT'S NEW.



84 POPULAR SCIENCE AUGUST 1959

### Tall Doors Add Space, Cut Cost

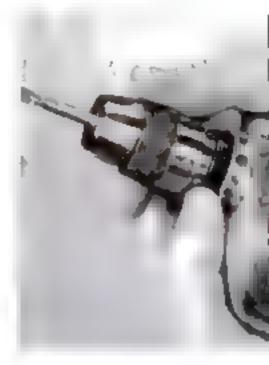
Besides saving bumped heads, new floor-to-ceiling doors like the one at left are said to cost less and look better. They eliminate conventional framing, let in more air and light and make rooms seem higher and more spacious. The 8' whoppers, soon available at lumberyards, have tough, warp-free, yet inexpensive facings of special hardboard. Masonite Corp., 111 W. Washington St., Chicago 2.



CAR WASHER. Pressing the sponge on this hose-fed washer trips a built-in valve that turns the water on or off, to save you running to the faucet, About \$3, Hopkins Mfg. Corp., Empona, Kan.

#### QUICK BIT.

You can change drill bits quickly with a new chuck that needs no key to lock it. Ball bearings inside let you spin it tight with finger pressure alone. The chuck is sold by itself or on new \(\frac{1}{2}\)" drills. Sears, Roebuck, Chicago.





POLKA-DOT TIRES. You can add a racy look to your car's tires by cementing on small colored disks of rubber. Made for either white or black sidewalls. they're said to stick on even if tires are curbed. Roger Berg, 3400 S.W. 108th St., Beaverton, Ore. Yep, you can even decorate your wife with matching dots.



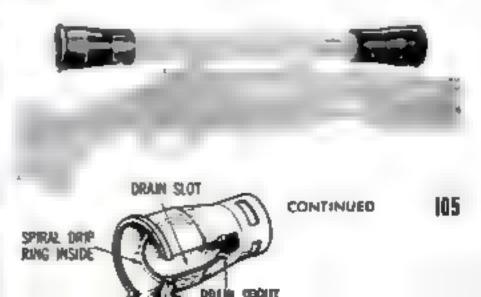
**SPOOKY SPECS.** Clipped to regular glasses, this eye shield tilts down to become sunglasses, up to become a shade. For night driving, it slides halfway up so that a slight down-tilt of the head

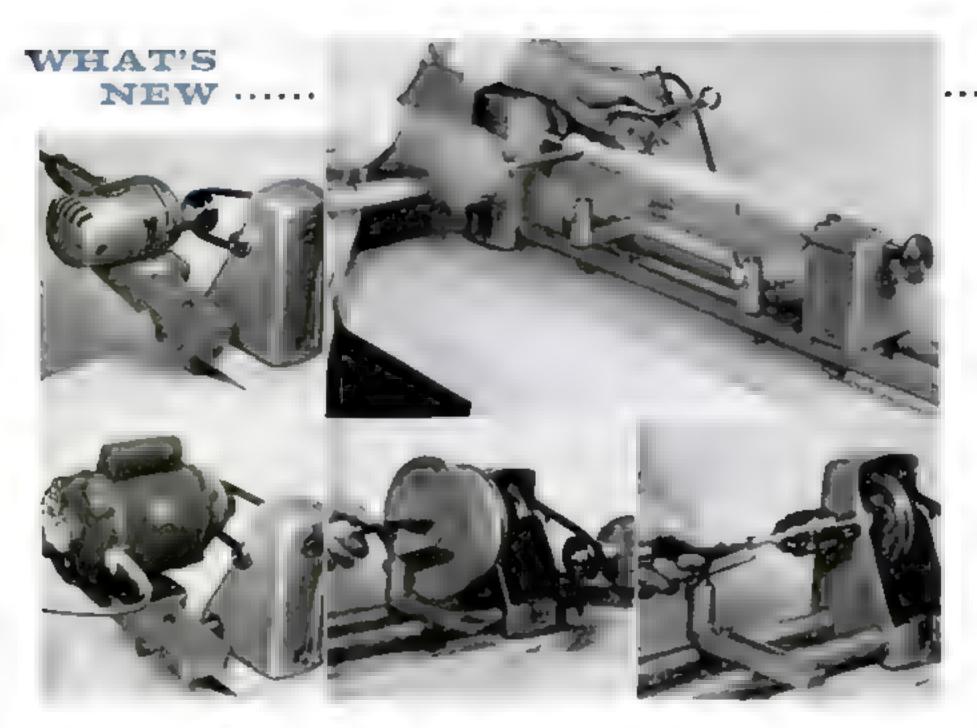
protects a driver's eyes from oncoming lights without obscuring vision. It comes in sizes and styles for men and women for about \$1.65. Nova Device Co., 136 Fulton St., Brooklyn, N. Y.

KIT SOFTENS WATER. You're said to save half the cost of a water soft-ener with this kit. It includes an epoxylined tank and all parts. Manual and automatic models are \$149 up. Associated Water Ind., Military Rd., Buffalo.

SNAZZY SIGHTS. Slipping these neoprene hoods on a telescopic sight dresses up a gun and keeps rain, snow and sun glare off the lenses. Four sizes fit most scopes. About \$3 a pair, PGS, Inc., 622 Gratiot Ave., Saginaw, Mich.







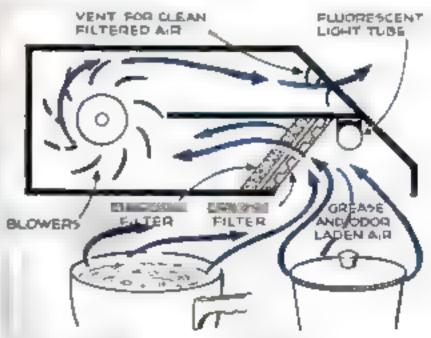
#### Lathe Runs on Any Motor

An ingenious motor mount on this low-cost lathe lets you use any power that's handy—a conventional motor, portable power pack, even an electric drill. The notched mount moves in and out to suit belt length and tilts up for quick chang-

ing of belt speeds on a four-step pulley. Extra chucks for holding rod stock or bits can be mounted in either the head- or tailstock. The lathe has an 8" swing, 30" between centers, sells for \$34.50. Millers Falls Co., Greenfield, Mass.



HOOD SUCKS SMOKE, grease and odors out of kitchens where conventional exhaust ducts can't be run through walls. Twin blowers inside the hood draw tumes first through a grease filter, next

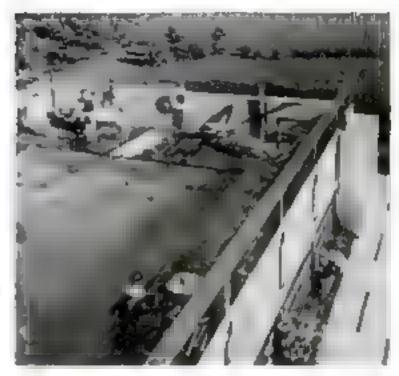


through a charcoal filter that traps odors. Clean air is then blown out vents at the top. Seven sizes are available from 24" to 48" wide. Ductless Hood Co., 601 Plandome Rd., Manhasset, N.Y.



can crawl into bed with an electric fan. This cloth sleeve pipes cool breezes between the sheets from any 10" or 12" pedestal-base fan. About \$8, B & G Products, Spring House, Pa.





ABOVE-GROUND POOL fits any terrain, can be moved, even roofed for winter use. It includes deck, fence, filter, vinyl liner for \$3,000 up. International Swimming Pool Corp., White Plains, N.Y.



portable Headrest lets your copilot catnap comfortably on long car trips. It can also be used as a beach pillow or backrest for reading in bed. About \$5, Mitchell Co., 1601 Ballman Rd., Ft. Smith, Ark.

HOMEMADE SUIT for skindiving comes as a kit. You get material, patterns and instructions for cutting the pieces and cementing them together. Made of a buoyant vinyl, the suit is said to float a diver in an emergency. It comes in four colors; about \$45. Skope Mfg. Corp., Norwood, Mass.

# How Safe Is Our A-Ship Savannah?



Engineers dreamed up worst possible accidents that might befall first atomic merchant vessel. Then they designed elaborate safeguards so radioactivity could never leak out

SHIP without a smokestack, just launched and now receiving its Inishing touches at Camden, N. J., will write maritime history with its maiden trip early in 1960.

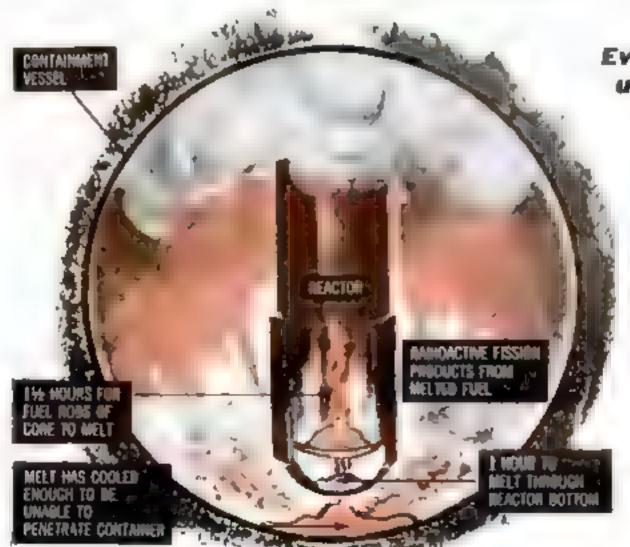
The 595-foot vessel is the 21,800-ton N. S. (nuclear ship) Savannah, the first atomic-powered merchantman.

On a single loading of A-fuel, the Savannah will have a range of 350,000 nautical miles, enough to take it 16

times around the world. It will carry 60 passengers, 10,000 tons of cargo. Its 20,000 horsepower will propel it at a cruising speed of 20 knots or better.

Heart of its propelling machinery will be a pressurized-water nuclear reactorsimilar in type to the one that generates electric power at Shippingport, Pa., and about a third as powerful. Fuel for the atomic "fire" will be uranium oxide.

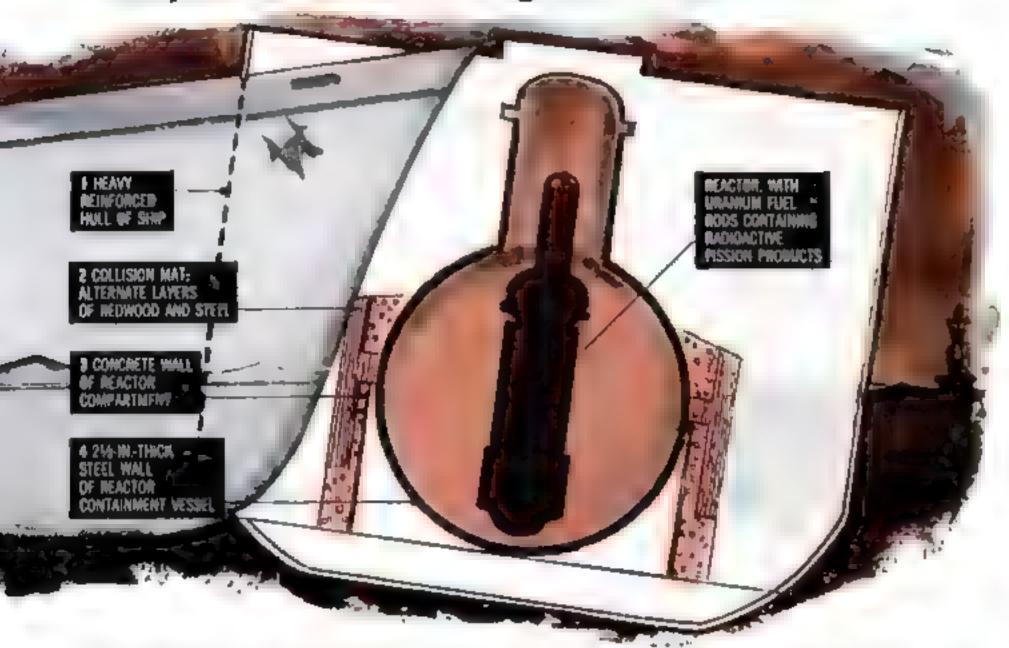
[Continued on page 204]



# Even reactor's burning up would risk no lives

WORST IMAGINABLE ACCI-DENT would be overheating and meltdown of atomic furnace—from loss of cooling water through a broken pipe, for example, Even then, containment vessel would prevent catastrophe. It is large and strong enough for all of cooling water to turn to steam without bursting it. Loss of water would automatically stop runaway, since moderating effect of water is needed to keep chain reaction going. Heut from radioactivity of fuel rods might melt reactor core. but container would trap loosed fission products,

### Four layers armor atomic vitals against collision



THESE SUCCESSIVE DEFENSES will keep a colliding ship from breaching the chamber holding the nuclear reactor, and loosing dangerous radioactivity. Only one of the world's largest vessels, running at high speed in the open sea, could possibly penetrate as far as the innermost 2½-

inch-thick wall of steel. In that case the reactor containment vessel might be dislodged, but would not be punctured. In planning safety precautions, designers figured on unluckiest collision: a prow squarely knifing section of the Savannah containing its reactor, as pictured.

# Safeguards seal ship if it founders

IN CASE SAVANNAH SINKS, reactor would automatically be shut down and chain stopped. Onereaction way valves would let sea water flood the reactor containment vessel. would not allow contaminated water to escape to ocean. Still further precautions are provided in case depth were so great that the reactor could not be salvaged. Divers would then be sent down to attach hose to special fittings atop the containment vessel and pump it full of concrete, entombing the radioactivity in an impervious, solid block.

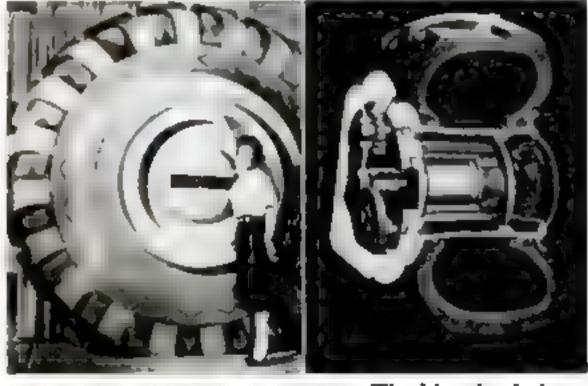






PRACTICE SHOT. GIS at Fort Campbell, Ky., save by using miniature mortar blanks instead of \$14 shells

The six-inch blank, compared with full-size shell in drawing, costs less than a cent a shot. Blanks are fired by compressed air from an adapter (above) at a bucket (left with an accurate range of an inch to the yard



HUB-MOUNTED MOTOR. The big wheel above has a built-in electric motor. It is made by GE for heavy earth movers. The motor is driven by an engine-powered generator, needs no transmission or gearshift.

sun cooler. The zany helmet below utilizes the hot sun to keep its wearer cool. A solar battery on the top supplies current to run a small electric fan mounted on a chin strap in front of his face.



# **PS Picture News**

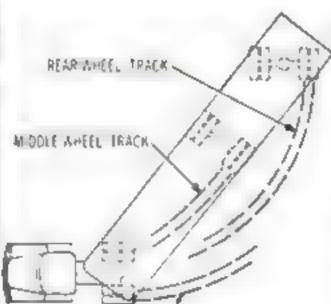
The flying dish at right would be kept aloft by power from the ground. Heart of the system is an Amplitron tube developed by Raytheon to transmit high-frequency microwaves more powerful than those from the magnetron used in radar.

Energy received would provide heat to run a gas turbine compressing air to spin helicopter rotors and keep the station up 30,000 feet or more.

Raytheon hopes to build a model for Air Force tests in missile warning, navigation aids, long-range TV and radio.

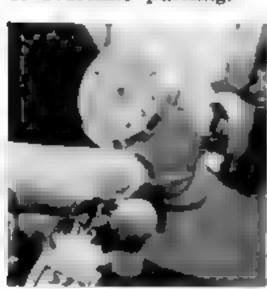






REAR STEERING. The middle axle of the 40-foot trailer at left is fixed, the one in rear is This device, pivoted. developed Transbv . Equipment Corp., Columbus, Ohio, keeps rear wheels of a long trailer within the arc of tracks of its tractor. Anything the tractor clears also is cleared by the trailer.

KEY WATCH. The Swiss-made watch below is mounted on a car key so it will be upright when the ignition is on. It has a luminous dial, an alarm to awaken a dozer, warn of overtime parking.





WATCHWORD. Sidewalk superintendents viewing progress on the new Western Electric building in downtown New York get a taped description of the work by phone. What they see through windows is shown at right.

In Baltimore, where the "traffic cops" are electronic computers—

# Drivers Make Their



# Own Green Lights

By John C. Schmidt

ENRY BARNES in Baltimore is waging a fight against the great American traffic jam, with electronic computers his main weapon. Despite a nine-percent annual jump in the traffic load during his first five years on the job, the tide of battle appears to be going in his favor.

Traffic engineers from cities all over the country are keeping an eye on the Baltimore system. Denver, Philadelphia, Detroit, Los Angeles are among the big cities that have climbed on the electronic bandwagon to solve their traffic problems.

Baltimore's traffic headaches are those of many large cities. Narrow streets laid out before automobiles existed carry not only the daily ebb and flow of carhappy commuters, but also the main stream of interstate traffic

Before Barnes came into the picture, traffic control was under a handful of commissioners who were given cast-off police cars, had virtually no money to spend for improvements, and debated the placement of every sign. Traffic signals were timed by a \$69 electric clock at Police Headquarters. They clicked monotonously red and green, the same at 5 p.m. as at 5 a.m. Traffic was rapidly reaching the point of self-strangulation.

City fathers ask for help. From Denver they brought a traffic engineer who had gained recognition for introducing an "all-walk" phase at busy intersections to give pedestrians a fighting chance. Dubbed the "Barnes Dance," it's a step people are doing all over the country today.

Barnes, who started as a police electrician in Flint, Mich., drove a hard bargain with Baltimore. But he put his case so convincingly that he came away with a higher salary than the mayor, a 250-man staff of specialists, almost unlimited authority in traffic matters, a vastly increased budget, and complete freedom from political pressure.

In five years, these are some of the



RADAR SAMPLING DEVICE (one of many) is shown suspended over a street at the end of a pole. It feeds information on the movement of traffic back to the big electronic brain.



HAND TELEPHONE plugged into a control box puts an inspector in immediate touch with head-quarters. System supplies city with independent communications link in case of disaster.

things he has done for Baltimore traffic:

 Designed and installed the largest all-electronic traffic control system in the world, a completely automatic setup which governs signals at more than 900 intersections.

 Installed more than 68,000 signs, including 9,000 bright red STOP signs to create a system of arterial streets.

 Put enough reflectorized lane-marking paint on the streets to draw a solid strip right back to Denver.

 Spent \$9,000,000 to give drivers the "green light."

Has it been worth

the price? Barnes has plenty of critics, but most drivers—even taxi drivers—agree he's done a good job. They are backed by statistics which show that 1.200 cars perlane-per-hour now move in streets where only 450 moved before. He figures that a \$50,000 signal installation on one street took the place of street improvements which would have cost \$50 million.

The nerve center for his attack on the traffic load is a master electronic "brain" — a row of gray

metal racks filled with tubes, relays and selector circuits. And far from telling motorists what to do, the brain in effect lets drivers create their own green lights by adjusting signals all over the city to meet the demands of the moment.

Information on the traffic flow in all directions comes in from dozens of radar samplers located on key streets. These give a picture of the ever-changing flow of cars, reporting their density, speed and direction to a battery of eight master units. Every six minutes the brain takes a fresh look at the over-all situation. Then from 220 possible timing combinations, it selects the one which will most effectively move the load. It always favors the heaviest flow.



phones. These provide 24-hour contact with police, fire, highway departments; transit and power companies, civil defense.

Automatic selectors choose from six background cycles ranging in length from 50 to 120 seconds. The computer can also set up three possible "splits," or red us, green time for a particular light, and can provide five variations in "off-set," or the progression of greens from block to block.

When a change is needed, the master unit sends out impulses to secondary controllers which tell each light what to do. At rush hours, for example, the brain selects the longest possible cycle, favorable to the movement of large masses of

closely bunched cars. Lighter traffic calls for a faster-changing pattern.

The brain works 24 hours a day, its relays clicking and small neon bulbs flashing orange—each flash indicating that a car has passed under one of the radar samplers.

Working along with the computer is an elaborate communications system. There is a radio room which looks like any small commercial radio studio, but the "program" is concerned only with what is happening on the city's streets. Receivers are tuned in

continually to police and fire department radio.

Dispatchers, on duty around the clock, have handled as many as 6,500 trouble calls in a 24-hour period. Within seconds after hearing of a signal burned out or a sign down, the dispatcher can have a truck on the way. Some trucks carry portable generators to light critical signals in case of power failure. Work orders are teletyped direct to the sections concerned; formerly these were mailed.

It took Barnes and his staff two years to design the new system. It was built by the Automatic Signal Division of Eastern Industries, Inc., and the "brain" part alone cost \$4½ million.



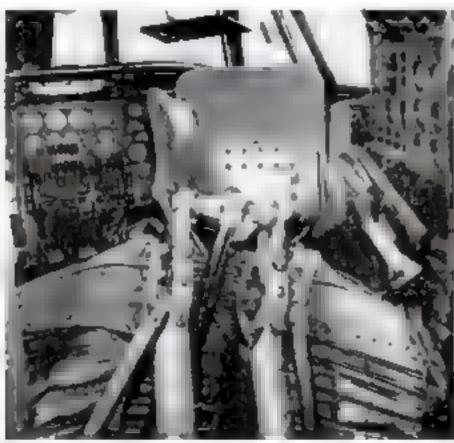
EASY FIX. Salvage and repair presented no at an airport. Note mechanic taping on matspecial problem when this plane cracked up tresses to cushion nose of the downed bird.

# How Lockheed's wizard of the quick fix makes

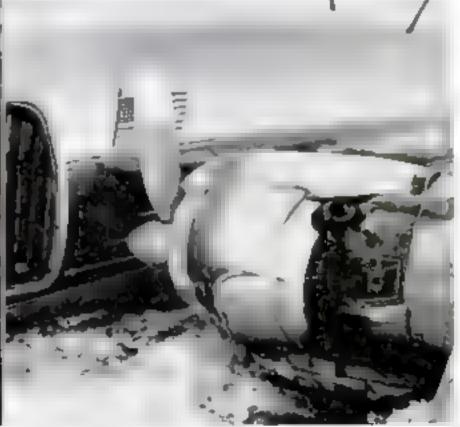
# Crashed Airliners Fly Again By Ellot Tozer

S LONG as airline pilots wash out a wing tip in a cross-wind landing, snap off landing gear by dropping in from about 75 feet up, or crumple a nose by taxing into a gas truck, Neal Thomas is going to make money. A wiz-

ard of the quick fix, he can tack a broken tail onto a DC-6 with baling wire. What's more, it will hang together until his pilot can nurse it home from the Arabian dune or the Greenland ice pack where it cracked up.



MAIN LANDING GEAR rammed copilot in this crash. But he and plane are both flying again.



ONE ENGINE came to rest nuzzling the fuselage after wreck. Most of the plane was salvaged.



A HARD LANDING at a South American airport broke this plane's back. Thomas splinted her

in jig time with aluminum patches and flew her safely back to N. Y. International Airport.

Neal Thomas' job is to take a quick look at a crippled bird on her belly in mud or snow and decide whether she's worth fixing. Sometimes a half million dollars rides on his decision. Often his life depends on it. After he has cobbled up a crashed plane with pieces of mahogany or sheet steel or whatever comes to hand, he usually rides it back to the repair shop at New York International Airport.

Thomas is Manager, Engineering, for Lockheed Aircraft Service—New York (LASNY), specialists in the jury repair

of cracked-up airliners.

A jury rig on an airplane is like the jury rig on a ship—a temporary repair. It's a fast fix that will hold the wings on until the mechanics can get her home. But the fix must meet airworthiness re-

FIRE IS A MAJOR WORRY. It's often hard to tell how badly wiring is cooked and internal ducting corroded. This plane wing burned when an impeller blade chopped a fuel line.

quirements of the Federal Aviation Agency. Thomas' patch on a DC-7's tail may look as though it will flap off when the Seven hits minimum cruise, but Thomas knows it's on for keeps. Or until he takes it off. And the FAA knows it, too. Thomas is not only a sharp mechanical engineer with a CalTech degree, he's a Designated Aircraft Maintenance Inspector for FAA.

Jury repair is big business today. And it's high-pressure business. A downed airplane is a staggering hability. Every hour it lies on the ground it costs the owner hundreds of dollars. A Constellation, running at an average load factor of 60 percent on a transatiantic run, can

bring in \$259,000 a month.

Pressure doesn't keep Thomas from coming up with some pretty weird fixes—or cut down his fun jockeying the beat-up birds back to LASNY. Take the time an impeller blade let go in the No. 3 engine of a transport on the taxi strip at Rio de Janeiro. A fragment chopped a fuel line in No. 4 engine. The resulting fire, fanned by a 10-knot breeze, was a five-alarm spectacular. When the flames died, the plane was a pathetic sight. The middle 30 feet of her 60-foot tapered wing was pocked with jagged holes. A layman would have said, "Put a new wing on it."

Quoting a price low enough to convince the airline that the plane is "economically repairable," yet high enough to make money for his bosses is the big job. This one was tough. From de-icer boot to trailing edge, the wing behind No. 3 and 4 was dead. And fire worries Thomas. He knows he can bracket the

IIE POPULAR SCIENCE AUGUST 1959



LASNY bought a second-hand "barrel" and "cradled" her into place with a fork-lift truck.



THEY RIVETED THE "BARREL" into place—and the plane promptly went back into service.

softness caused in spars and skin by gasoline-fed flames. He works outward from the soft spots to hard skin with a hardness tester. But he never knows how far the flames have flickered along internal ducting. Nor how badly the wiring is cooked. And if the crash has triggered off lawsuits, he can't break open the plane to take a long, careful look.

He told his crew, "We'll shore up the leading edge with wood, bend some aluminum around it to complete the airfoil, and strengthen the entire section by riveting some stringers to the outside. That'll get us back to New York."

To the owners he named his price. They frowned, said, "O.K., if you can do it."

It's often a gamble—and this one almost paid off. When he was ready to fill No. 4 main gasoline tank for the test flight, he found that the fire had loosened the tank's rivets. It leaked badly.

Thomas took a deep breath. It would take several more days to unbutton the wing, disconnect the leaky tank, and install a new one. "So," he said, "we'll fly to New York without No. 4 main."

The pilot protested, "I can't keep her trimmed without any weight out there in that wing. She'll skid all the way."

"I thought of that," said Thomas, "We'll fill the right outboard tank with water."

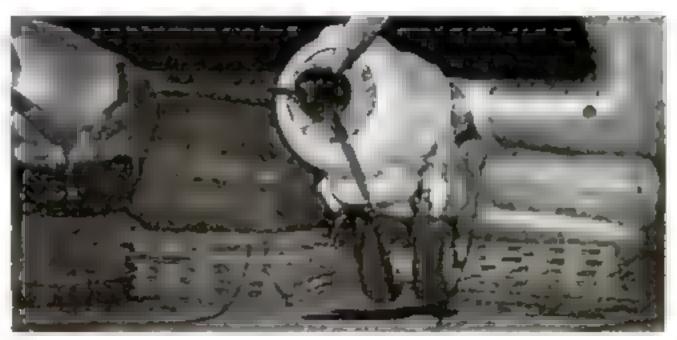
The pilot looked at him. "When we've used up the gas in the left outboard tank, the right will be full of water. Then I'll be out of trim the other way."

"I thought of that, too," said Thomas. "We'll jettison the water at the rate you use up the gas in No. 1—allowing, of course, for the difference in weight-pergallon between water and gas."

They staggered into the sky with No. 4 main leaking water all over the Brazilian landscape. The flight plan called for stops at Recife, Belem, Port of Spain, Havana and Miami.

Just as they hit the valve to jettison the first load of water, Sao Salvador radio crackled into their headsets, "079, you're on fire."

A FEW POUNDS OF AIR per square inch kifted this U.S. Navy craft high enough so that jacks could be fitted under her wings. The big danger here is slippage—plane could roll off the bags.



Thomas leaped to the window. The spray of water drifting out behind them looked like ribbons of smoke. He laughed. "It's O.K.," he radioed.

But the big laugh was to come. When they taxied gingerly into Recife, a startled lineman ran screaming for a fire extinguisher. He pointed to the liquid dripping from No. 4 main. "Cut the switches," he yelled. "You're leaking fuel all over the ramp."

Thomas looked and shrugged, "Forget it," he said, "We're in a hurry." He stepped out. "Put in 800 gallons of water

and clean the windshield."

When they finally calmed the lineman down, he said only two words: "Crazy Americanos."

An airpiane is a simple thing in structure. You take an I-beam for a core and call it a spar. You lay airfoils across it and call them ribs. You sheathe with aluminum —and call the whole thing a wing. To make a fuselage, you curve some more I-beams into circles, stand them up one behind the other. and tie them together with long strips of aluminum called stringers. Then you lay this shell on top of the wing spar.

This shell-on-a-cross- a common to be tends to tear apart at the seams if it runs into anything solid—as the pilot for a Latin-American airline found out not

long ago.

Instead of flaring out his 50-ton airplane just before touch-down, he flew her

straight into the asphalt.

Two of the four engines broke their mounts. Wing skin tore. And the tail fell off. In fact, the shock broke the plane's back and the last 30 feet of shell fell onto the runway.

Thomas peered at the pieces, then talked to the pilot. Says Bill Mueller, one of his assistants, "Tell Neal the temperature on the day of the crackup, the atmospheric pressure and humidity. Then tell him what weight the plane

was grossing, her speed, and the angle at which she hit. He'll tell you how many rivets popped without even looking at the wreckage."

Though this may be an exaggeration, Thomas can tell, through long practice, pretty accurately what spars will have broken and which fittings will have torn loose if the pilot clues him completely on just how the accident happened.

Bracketing the damage is his next step. When he left the Baranquilla terminal that day, he walked quickly to the wreckage, ordered the inspection ports opened and took a score of X-rays of the

wing spar and the landing-gear shock strut. When asked why he didn't inspect the fuse-lage first, he laughed. "I knew what was the matter with the fuselage—it was broken. I wanted to find out whether the gear struts had torn loose from the spar and whether the spar had cracked."

With X-rays in hand, Thomas walked to airline headquarters. Now came the toughest part of the job. The airline would gladly write off the ship for the insurance—and a new plane; but the insurance company might not be willing to do that.

If the insurance company insisted that the plane be repaired, the

airline would want the job done at a rock-bottom price—partly, of course, to save money, but also in order to keep its insurance rates low.

There are lots of variables. He had to guess whether the airline would want to do part or all of the repair itself under his direction. He scratched his head, trying to remember whether this airline carried its hull insurance in pesos or dollars and what the prevailing rate of exchange was.

And all the time, little lights were blinking on in his mind like a Univac digesting a thousand digits: How much would it cost to buy and ship in that

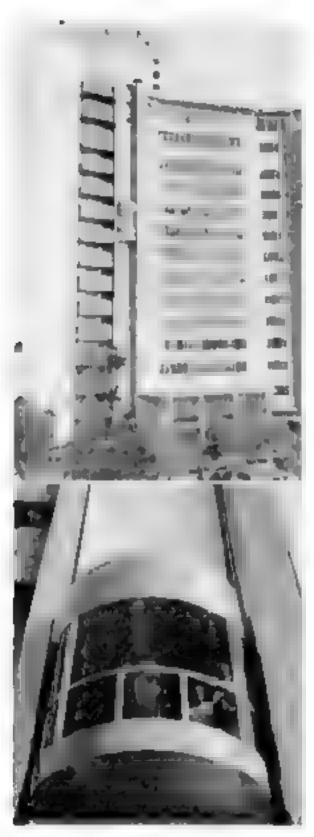
[Continued on page 192]





BARGE: Maybe you thought it was just a flat-bottomed boat for transporting goods. Originally it meant the boat's exact load: 21.2 long tons. (A long ton is 2,240 pounds.) That same "barge" measure is called a keel when shipping coal. You know, "Carrying keels to Newcastle," (All right, "coals"—but the words bespeak a common heritage.)

# **PS Picture News**



VIEW LIFT. The elevator above runs outside the Saxony Hotel in Miami Beach to its night club on the fourteenth floor. The swank car takes on 33 passengers at the lobby, whisks them to the top without a stop. It is air-conditioned, carpeted, has dimmed lights.

### TREE UPROOTERS.

The three huge eight-foot steel balls at right, strung on anchor chains and pulled by tractors (top), were used to clear 100,000 acres of tough African bushland for a hydroelectric power site in Rhodesia. The big balls are honeycombed for maneuverability, strength.



RADAR TOP. The radome over the cockpit of the Bell RH-2 research helicopter at top covers the radar antenna in the lower photo. It's an obstacle sensor that equips the whirlybird for all-weather instrument flying -part of a new system for the Army and Navy.



# **PS Picture News**



DEW LINE EXTENSION, This radar station atop rugged Cape Sarichef on Unimak Island is one of six erected in the Aleutians to prevent enemy end runs around our Distant Early Warning Line across Alaska and Canada (inset map). Stations are spotted at intervals of 100 miles.



flying barrel. First full-scale model of the wingless Aerodyne (left), U. S. version of France's Coleoptere (PS, June '59). It was designed by Dr. Alexander Lippisch for vertical takeoff and landing, is being made by Collins Radio Co. for the Army and Navy. Two contrarotating props in the fuselage pull air through.



FIBERGLASS TRUCKS. To reduce over-the-road weight, two leading truck builders have now gone into fiberglass. The White (left) has a complete fiberglass cab that tilts forward; the Kenworth has fiberglass hood and fenders that also tilt and are light enough to be entirely removed.



# That Wonderful Cement Mixer of Mine By Henry B. Comstock

tractor left me with a raw clay slope that let go every time it rained. It plopped into window wells and did a wall-to-wall carpeting job on the basement floor. That, indirectly, is why I'm now the proud owner of a 214 cubic foot cement mixer.

You would hardly call it an impulse

buy Between 1941 and 1958 I worked stubbornly with a mortar box and hoe, whipping up concrete to tame and land-scape the unruly grade. Over the years, I kept finding new uses for the wonderful stuff that hardens into stone overnight. But there was one high. Folding cement into sand and gratery by hand is a chore that grows no are.

# Here's the way a pro told me to charge the bucket



WHEN SAND AND GRAVEL ARE DRY, use three parts cement to two parts water. Pails of like capacity speed measuring. A mark on one shows water level when it's two-thirds full.

WITH MIXER RUNNING, dump in the water. Then add a couple of scoops of gravel. This sets up a scouring action that will prevent caking of cement on the drum interior and blades.

ence. So last spring I threw in the boe. The rig I bought had nothing flossy about it. It came with a hand crank and a wheel-less chassis. But the manufacturer had thoughtfully spotted holes for a power platform, and tossed in a pulley and belt guard. The accompanying dope sheet recommended a \(\frac{1}{3}\)-hp, electric motor or a 2\(\frac{1}{2}\)-hp, gas engine.

With some misgivings I harnessed up a quarter-horse job scrounged from a 1934 washing machine, I needn't have worried. Either the motor was feeling its volts again, or the instructions were over-cautious. When I turned on the juice and tried to stop the drum by hand, I was lifted off my feet and nearly judoed over it. Listening to the businesslike rumble of the ring gear, amplified by the empty barrel, I had a feeling the mixer and I were going to get along fine.

Two hours later I wasn't so sure. By then I knew I had goofed when I settled for a stationary model rather than a handportable one. There are only two ways to move one of these comparatively light but bulky and top-heavy machines. One is to con a neighbor into helping you carry it—a shin-splintering operation that will find him behind closed shutters next time he sees you breaking camp. The

other is to improvise some sort of twowheeled underframe.

The lack of wheels was double trouble. Before I got around to adding them, I set up the mixer some distance from a work site. Flipping the drum experimentally, I found that in full-dumping position it wouldn't clear my wheelbarrow, or even the large wash tub I often use to skate mortar and concrete to inconvenient working locations. I'd have to plop the "mud" onto a ground-level platform and relay it from there.

Since then I've learned that this holds true of most small mixers, and with some reason. If the bucket is placed for barrow loading, it's much too high when you tilt it back for shovel or pail loading and mixing. That's why big contractor-type rigs are generally charged from a ramp.

As a compromise, I boosted my mixer onto four cinder blocks. That would let me dump directly into the tub, and still keep the upturned bucket within reasonable feeding height. I made a mental note to build my wheeled underframe 8" high, to get the same clearance.

What about formulas, now that I was ready to let the machine take over? For years I'd been proud of my ability to squirt just the right amount of water into

# . . . for the fastest and most accurate concrete mixing



NEXT, CHARGE THE DRUM with one pail of cement for each measure of water. Finish with enough aggregate (that's sand and gravel), to give you the kind of concrete mix you want.

FOUR MINUTES OF TUMBLING is enough to blend most batches thoroughly. A good formula for the majority of jobs is one part cement, two parts sand, four parts medium-fine gravel.

the dry makings of a stiff troweling mortar or a more plastic pouring mix. No measuring—just intuitive timing with the hose. But this was going to be different: smaller batches, poorer visibility, less evaporation. And which should come first when I loaded the drum—the water, sand and gravel, or cement?

I called up a contractor friend, and he gave me the official etiquette. I followed his instructions and in a matter of minutes had a relatively small batch ready for a footing form

Next time, I doubled the formula. There was plenty of room for it. The water went in fine; so did a couple of scoops of gravel. But when I followed with a slug of cement, the stuff jelled in a brief half-turn around the drum, fell heavily into the whirlpool again—and shot back in my face with the explosive force of a Mack Sennett pie.

As soon as I had flushed it off and dunked my eyes in boric acid, I inspected the stop bolt on the mixer's handle. By loosening and moving it forward in an arced slot, I could adjust the drum to work at a higher feeding angle. I overdid this on the first try; too much of the charge stayed at the back of the bowl, where the blades couldn't slice away at



SMALL BATCHES OF MORTAR are as easily mixed as concrete. Here it's simplest to use special mortar cement, with from five to six parts sand and just enough water for a stiff batter.

it. But a bit more juggling gave me the fairly critical angle needed to mix a heavy load thoroughly. I indexed the setting with a scratch mark. I added another, some time later, when I had to readjust the angle to handle smaller batches of

# Protection for yourself and the mixer



MUD WASPS like to build nests in mixer drums and may give you a hard time when you start the motor. Between jobs, plug the mouth with netting and flip the bucket to dump position.



A GREASE GUN is practically indispensable for lubing drum spindle and pinion-shaft bearings. Special guns using lithium cartridges are easiest and least messy to load.

# Mixer-cleaning trick

Toughest chore, when you're through for the day, is removing the "mud" from the blades in the drum. Try this: Throw in a pail or two of water, a shovel of coarse gravel and a dozen or so small stones. Run the mixer while you clean the other tools. The stones will dislodge the heavy deposits and the gravel finishes up the job. A word of caution, though: Don't use stones any larger than your fist or they may dent the drum or bend the blades.

mortar. This way I can make a quick changeover.

That was the end of my troubles with the mixer. Last year, the two of us didn't quite finish a swimming pool. But there were interruptions: whipping up mortar for an outside entrance to a new storage area under the porch and walling in part of an old garage doorway for a picture window.

No task is too large or too small for the tireless little rig. Take the pool, for example. Normally it would have made sense to use ready-mix. But no truck could have pulled within sluicing distance of this particular hill site. With the mixer I was able to set up 40 tons of side walls in 10 weekends.

When it came to pouring the rough underfloor, I contracted for a day's help from three robust relatives who, I figured, would benefit as much by the finished project as I would. I thought of renting a second mixer so we could work in teams. But as it turned out, mine was more than a match for our combined charging and dumping efforts. Between sunup and sundown she churned out 3½ cubic yards of coarse mud for the 6"-thick slab.

Loving care for the mixer comes naturally after service like this and I reward mine by treating it with consideration. At the end of each work session, I scrub it out thoroughly. This takes stern selfdiscipline, when muscles are knotting and supper is carbonizing on the kitchen stove. But the one time I neglected it was enough. A cement bucket is the next thing to a solar oven when you put your head inside to chip away a couple of pounds of cured concrete.

Lubing is another chore I take seriously. I bought a small Alemite gun to handle the drum spindle and pinion-shaft bearings. As for the ring gear and pinion, there are two schools of thought about applying grease to their teeth. One says: "Don't—the stuff simply attracts and holds sand and fine gravel, making teeth wear out faster."

My contractor friend disagrees. He tells me he's tried both ways, and heartily recommends an occasional dose of lithium grease, after cleaning out any accumulated grit. I go along with him. That wonderful cement mixer of mine deserves nothing but the best.



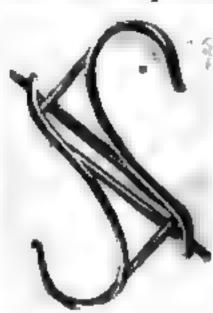
# Short Cuts and Tips

### Automatic Gate for Electric Fence

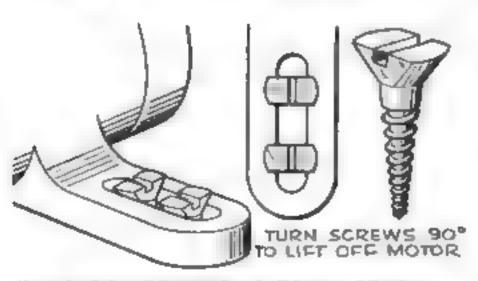
A FARMER I know who has an electric fence put a gate on it that never needs to be opened or closed.

He fastened screen-door springs between the gate posts at each end of the wire, which is set near the ground. When wheels pass over, the springs give and then anap back into place.—
Kenneth Imig, Watseka, Ill.

### How to Improvise an S Hook



WHEN I needed an S hook to hold a pail while painting, I made one out of two wire coat hooks by pressing the screws through the outer loops. Arranged this way, the more weight put on them, the tighter they lock.—Charles F. Rehm, Sheboygan, Wis.



# Portably Mounted Shop Motor

When you mount a motor that you may have to move once in a while for use in another part of the shop, it's a good idea to file the mounting-screw heads flat on two sides.

Then all you need do is turn them 90 degrees and they will clear the slots so that you can lift the motor from its base.

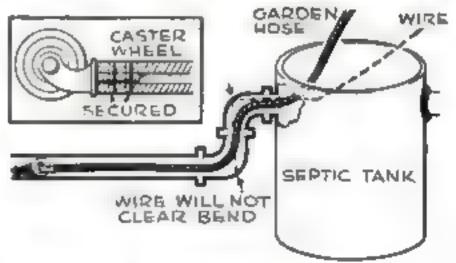
—Jack Crockett, Nuevo, Cal.

### Cookie Cutter Marks Corners

A CIRCULAR cookie cutter will work fine when you want to mark off a piece of stock for cutting the corners round.

The knob provides you with a firm hold, minimizing the chance of a slip while you are laying out curves.—Donald Spichuk, Brooklyn, N.Y.

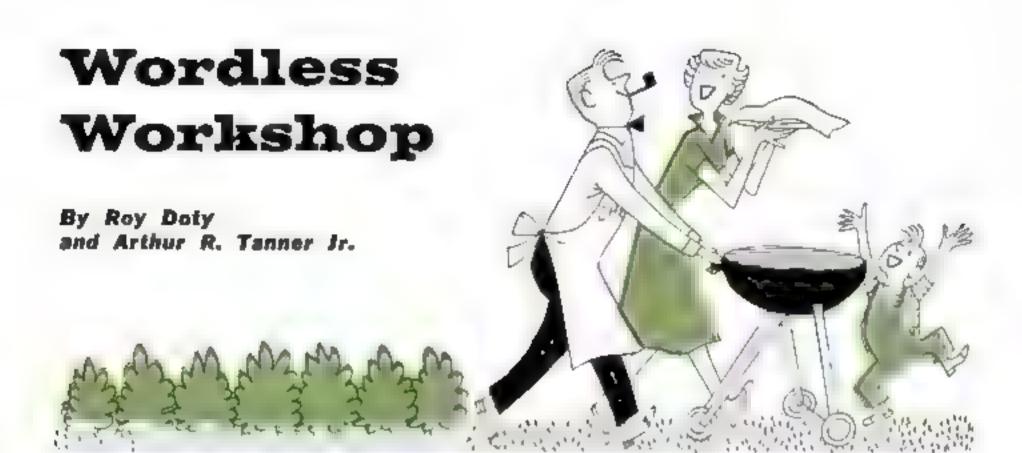




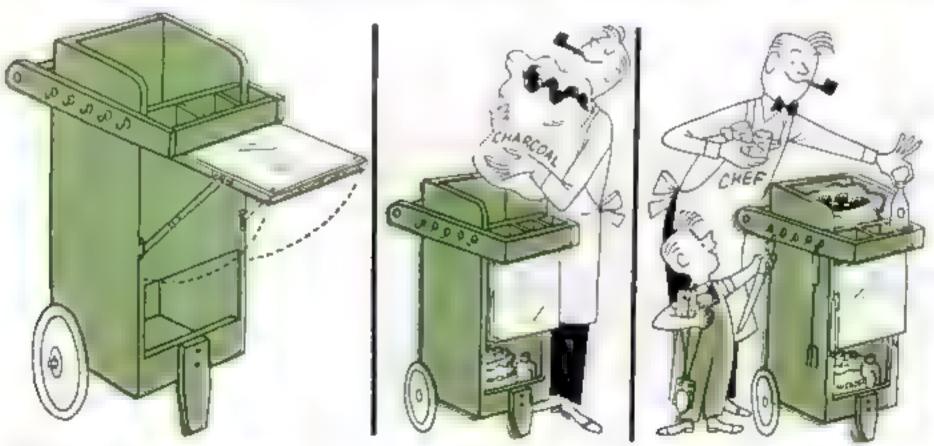
# Clearing Out Drain Elbows

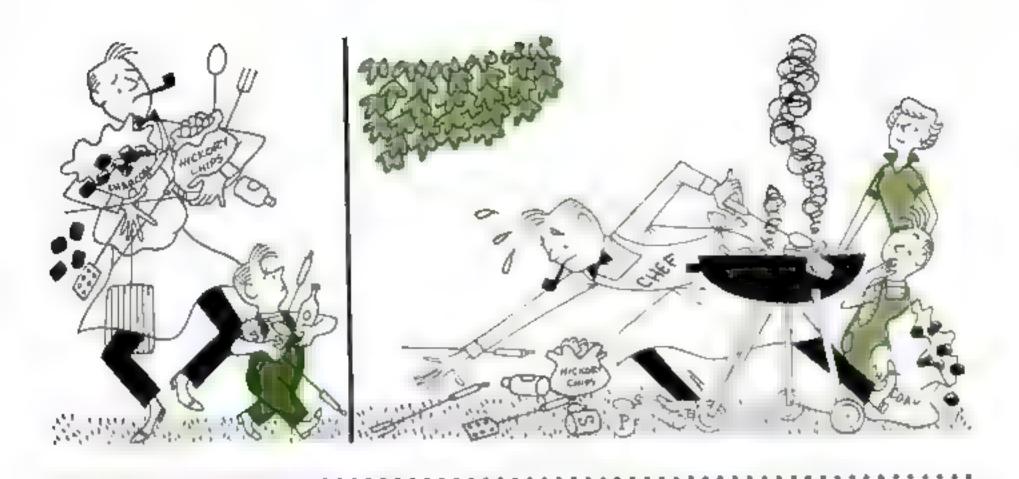
When I found a wire wouldn't pass a bend in the drainage line to my septic tank, I clamped a caster into one end of a length of discarded plastic hose. Put through the drain opening, it rolled past elbows and over ridges effortlessly. I pushed it in and out a few times to clear sludge and solids. It didn't kink once.

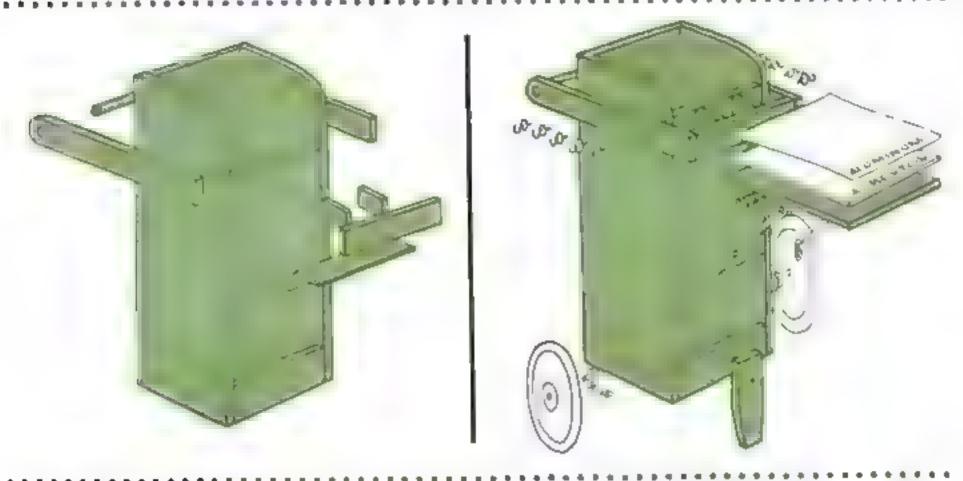
—John Franklin, Frenchmans Bay, Canada.

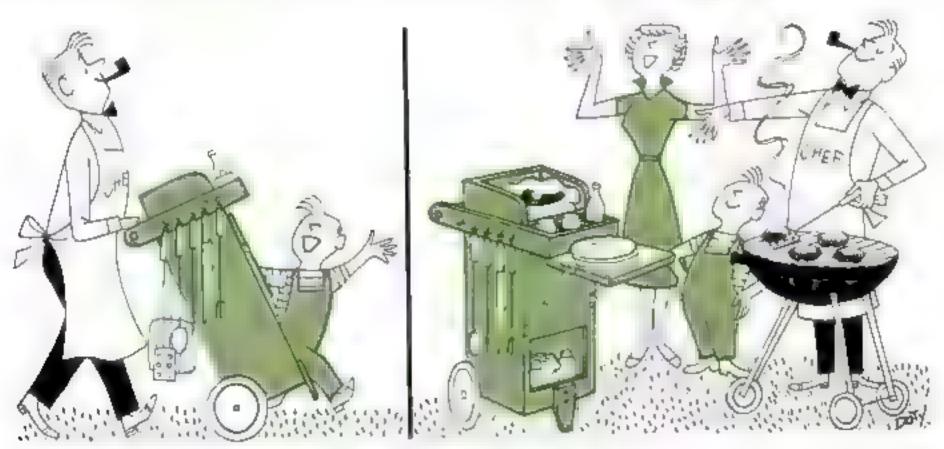




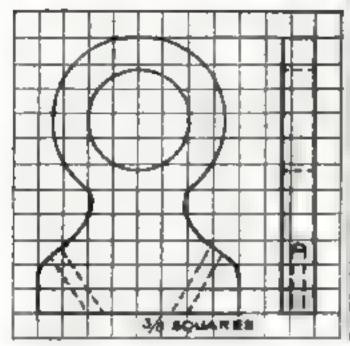














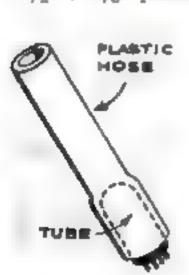
### Individually Styled Brackets Support Curtain Poles

You can design your own curtain-rod brackets from \frac{1}{2}" walnut, oak, maple, mahogany or other hardwood scraps to match your furniture or room woodwork,

Trace the pattern on the stock and cut with a saber or coping saw. You may have to stain the poles—they are usually oak.
—Scott J. Saunders, Plainview, N.Y.

### Removing Radio and TV Tubes

You can make a tool that handles miniature radio and TV tubes with a length of \(\frac{1}{2}\)" or \(\frac{1}{8}\)" plastic hose. Press an end of



the hose over a tube when the set is hot. Then turn the set off and, when the tubes cool, take off the hose. The heat will reset the plastic so it will grip tubes for removal or insertion in hard-to-get-at places.—A. E. Hryant, Lynchburg, Fa.

# **Dressing Up Medicine Cabinet**

ONE way to keep a bathroom medicine cabinet looking uncluttered is to arrange toothpaste and other tubes neatly

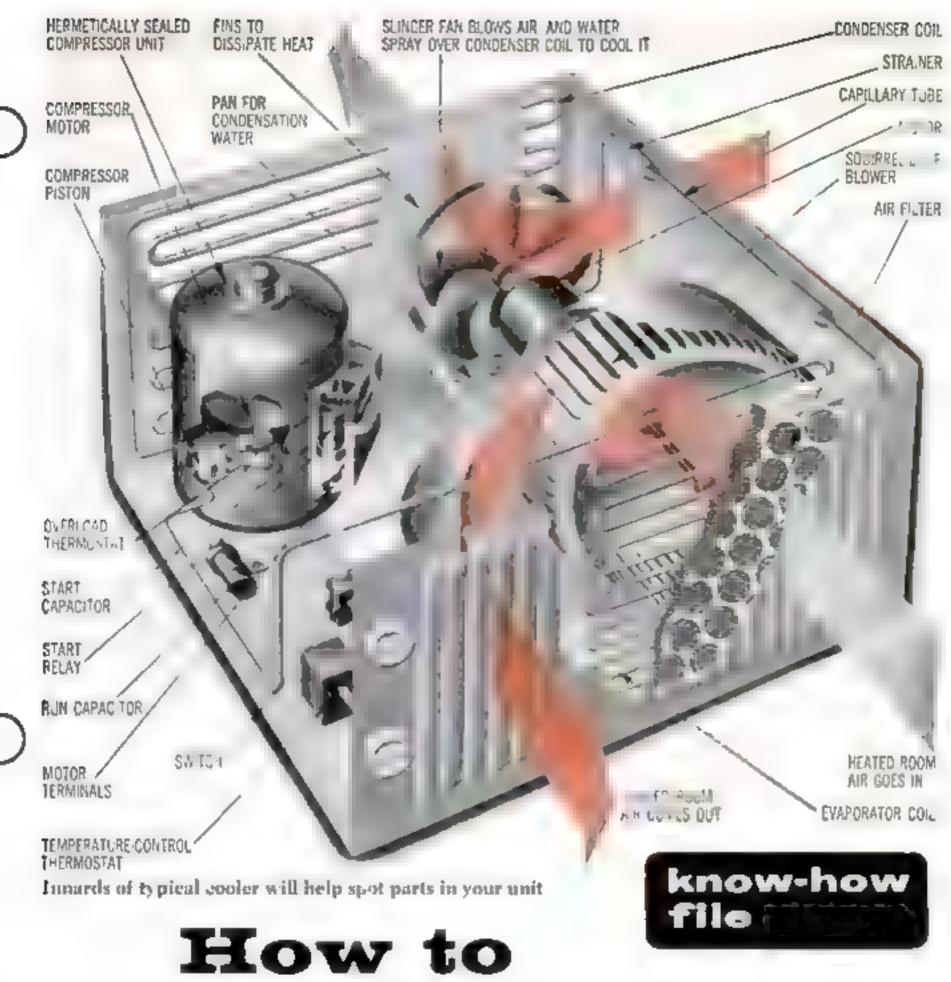
on the back and side walls. You can do it with small nails and spring clips. Hold tubes by the bottom end—one clip will take two if you have a lot of them. Hang the most frequently used at the front.—Barbara Nicholson, Park Ridge, N.J.



New Index of PS How-to-Do-It Articles Is Now Ready

DO YOU file away each issue of Popular Science Monthly? Would you like to be able to refer with ease to articles of particular interest?

You can do so with a new index. It covers all items that have appeared in the Mechanics & Handicraft section for the past year, from July, 1958, through June, 1959. To get the Index, send 10 cents in coin or stamps for handling and postage to Index Editor, Popular Science Monthly, 355 Lexington Ave., New York 17, N. Y.



# How to Repair a Room Air Conditioner

HEN a room air conditioner conks out, first thing you ought to know is what you should not do. There is a lot you can do yourself, but it's usually best to call in a serviceman if—

 The sealed compressor unit breaks down, or

 You find a leak in the refrigerant lines.

As with any machinery, you have a

THEN a room air conditioner better chance of repairing an air condiconks out, first thing you ought tioner if you know how one works.

An air conditioner operates on the same principle as a refrigerator. A liquid that boils at a temperature well below zero degrees—usually Freon 12 or 22—is the secret. As it changes from a liquid to a gas, it absorbs heat. And when the gas changes back to a liquid, it releases heat.

To put this principle to work, your room unit pumps the liquid refrigerant through a narrow tube called a capillary. This reduces the refrigerant pressure and it vaporizes as it passes through an evaporator coil on the room side of the unit, extracting the heat from the hot room air.

The hot low-pressure gas is pulled into a motor-driven compressor where the pressure is increased. The hot high-pressure gas is then pumped into the condenser coil on the rear of the unit. In this coil, the gas is cooled sufficiently to change it back into a liquid, and, in so doing, it gives up its heat outside.

The refrigerant then goes back to the capillary tube to start the cycle all over again.

A motor with a fan on both ends helps along the hot-air transfer. The fan on the room side pulls hot room air through a dust filter and evaporator coil and recirculates the cooled air back into the room. The other fan slings out the moisture that drips from the evaporator, helping to

cool and liquefy the hot refrigerant and reduce room humidity.

The units that both cool in summer and heat in winter work the same way, but have a thermostatically controlled valve that reverses the flow of the refrigerant through the coils. In cold weather, it removes heat from outside and releases it in the room. Some units are also equipped with electric resistance heaters to help on a very cold day.

Consult the chart to know where typical troubles lie. In many cases a symptom may mean more than one trouble Here is how to start.

The sneaky little troubles listed in the "general" section of the chart may seem so obvious they may be overlooked. Eliminate these first.

The electrical system is the next suspect when general checks don't spot the culprit.

Make up a tester as shown. With it

						ME	GW.	ANI	CAL			~	Latin	
Room Air Conditioner Trouble Shooting Chart	CAUSES W	Filter dirty	Co.ls blocked or dirty.	Room (hermostat set too high	Dempter improperty sat	Diower loose on shaft	Fan toose on shaft	Low outdoor temperature	Unit not level	Compressor mounts defect ve	Temperature control dia set for cont nuous run	Unit too small	Damper damper dul or contro rods bent or binding	
SYMPTOMS ▼  Poor cooling (or heating*), compressor	and											9		+
ien running No cooling (or heating*), compressor in running	ot	ŏ		•				•						+
Compressor won't start, fan motor runs														1
Fan and compressor won't run														T
Fan motor won't start, compressor runs	5													1
Compressor operates continuously					•							•		1
Insuffic ent air volume					•	•								
Compressor cycle short, fan motor runn	)PE				•	•	•							
Blown fuses			•											Ī
Fan motor runs interm trently, compress	207						•							1
Unit noisy, or excessive air noise						•	•			•				1
Condensat on water overflows									•					1
Excessive frosting of evaporator coils		•						•						
metrol dials hard to operate											Ì			Ì

# How to stop troubles with room coolers before they begin

PREVENTIVE maintenance is the most profitable "trouble-shooting" time you can spend on your air conditioner. A good time to begin is when you start up your unit after the winter

 Lubricate the fan motor with No. 20 oil (on those motors requiring oil) every year in northern climates, every six months in hot regions or if you are a

year-round user.

 Inspect the air filter at least once a month, following the maker's instructions for cleaning.  Check for clogged condensation drain lines twice a season at least.

 Test the fan and blower wheels yearly for alignment and possible slippage on the shaft. Wipe off oil, lint and dirt.

 Look at the coils monthly. Brush off dirt and straighten any bent fins

 Trim off vines or shrubs that grow high in front of the condenser coil

 In the fall, store the unit in a dry place, or protect the outside with a tightfitting cover to keep out freezing snow and rain.

you can check out nearly every part. It indicates when there is a flow of current through a circuit. Use it as in the photos, with or without the power applied.

Room units are generally wired to

allow the fan to operate independently to circulate room air without cooling (some models have two separate motors).

Compressor operation is usually governed by a thermostat. When room tem-

	Aeversing valve defective*	•											
	Moisture in system	•					•				1		
IGE	Restrictions in refrigerant lines	•					•						
	Low refe gerant charge or loss of charge	•										•	
	Compressor defective	•	•	•									
fective"	Electr & healers defective		•					•					
Solenoid	Reversing valve soli defective	•						•					
	Low Line voltage	•					 •	•					
notor ounded	Fan motor defective moto					•	•	•	•	-			
defective	Compressor Motor o		•	•		+	•	•					
	Compressor over oad thermostal defect ve		•	•			•						
C T R	Compressor starting relay defective		•	•			•	•					
	Compressor motor run capac tor defective						•	•					
'start'	Compressor motor capacitor defective		•	•				•					
орей	Loose connections circuits		•	•			•	•					
	Temperature control thermostat detect ve			•			•						
	Incorrect fan speed	•					•					•	
14 Mg.	Fuse blown, switch or detective		•		•	_							

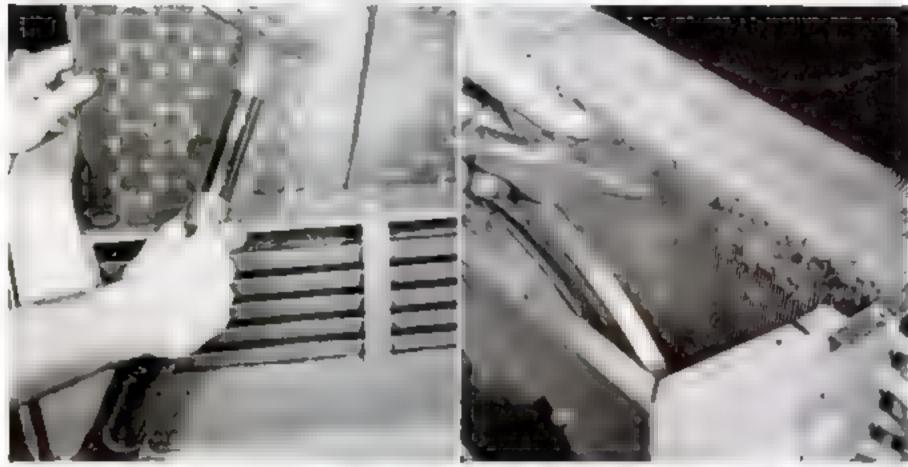
perature rises, the thermostat switch applies power to the compressor-starting relay, which temporarily allows a high current to bypass the running capacitor. This creates the high torque required to start the hefty compressor motor. When a proper voltage appears across the relay coil, its starting contacts open and the running capacitor and running-motor winding take over.

A bimetal overload thermostat is connected in the compressor circuit to cut off the power should the compressor become overheated in starting or running.

Check visible troubles like fuses, loose or broken wires, or visibly damaged parts first. Compare the typical circuit diagram with that of your unit. You may find this glued to the cabinet interior or in the owner's manual. If not, write the maker for one. Pay heed to his color code to make wire tracing easy.

Low line voltage can cause hot motors, erratic operation, poor cooling and blown fuses. Eventually, it can knock out the unit. You can be reasonably sure line voltage is adequate if the unit has performed normally in the past and if the distance from the outlet to unit does not exceed the maker's recommendation. Be sure that your house wiring is adequate for the load and that no heaters or major

# Operation 1: Correct these simple mechanical faults first

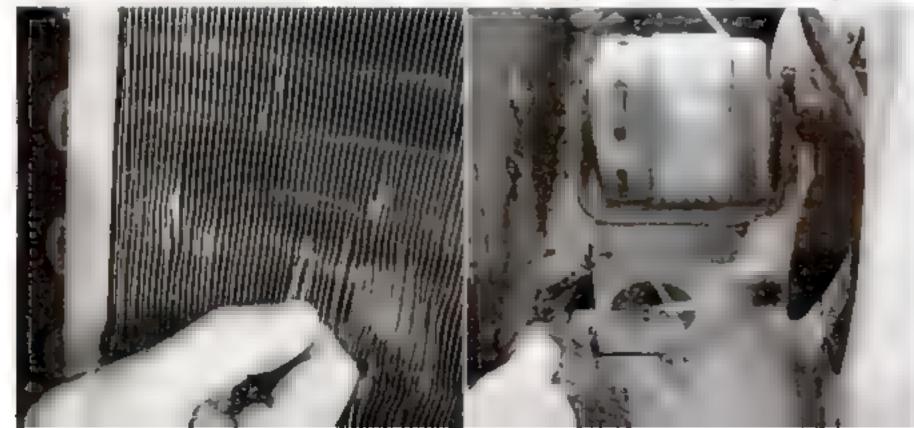


CLOGGED FILTERS can cut down cooling and cause a conditioner to run itself ragged. Check them once a month; follow the maker's instructions for cleaning your particular type.

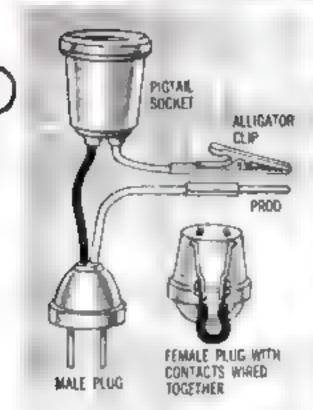
out of the unit, blow from inside out. If necessary, use a brush carefully on the fins.

**BENT FINS** on condenser or evaporator strangle efficiency; lead to other troubles. Straighten them with a U-shaped wire, slid gently up and down. Make sure you don't scratch the coils.

CONDENSATION WATER must run freely from the evaporator coil to pan for the slinger fan. Clean dirt and debris from the trough. Coat any rust spots with a rust-preventive paint.



# Operation 2: Now you're ready to tackle electrical failures



HOMEMADE TESTER checks shorts, opens and grounds quickly. Make it from a rubber-covered pigtail socket wired as shown to a plug, prod and clip. Female plug with its contacts wired together lets you shunt male plug for "power-on" tests. Use a 25-watt bulb in the socket.



made with tester plugged into 115-volt extension cord. Here, compressor-overload thermostat is checked for open circuit. If bulb lights with clip and prod on contacts, continuity through circuit is okay. Don't touch both the clip and prod at same time.



TESTS WITH POWER ON are made with tester plugged into special shunted plug, and current comes from machine itself instead of extension cord. Here, a switch is checked for continuity. If bulb lights, switch is okay and trouble is elsewhere. If it doesn't, switch is bad.



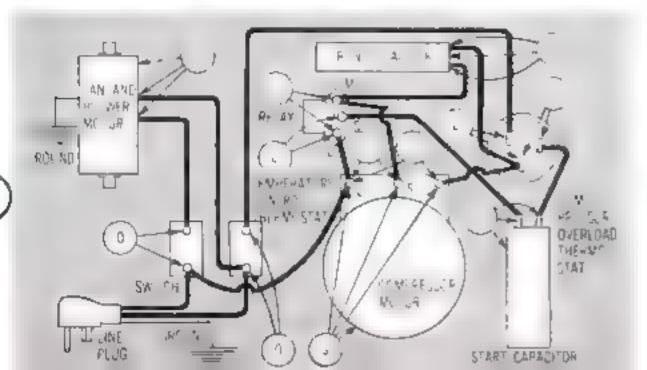
TEST FOR SHORTS in capacitors by substituting a 10-amp fuse for the bulb and plugging tester into 115-volt line. If fuse blows as prod and clip touch capacitor's terminals, capacitor is shorted and must be replaced Caution: first unplug unit and discharge capacitor.



rest for Grounds on metalcased capacitors next. With bulb in socket and tester plugged into line, touch the prod and clip between capacitor's case and its terminals. If bulb lights, capacitor is grounded to its case and must be replaced with another of the same type.



TEST FOR OPENS in capacitors by using tester plugged into 115-volt line in same way as for grounds. Bulb should light when clip and prod are placed on capacitor's two terminals. If it doesn't, no current is getting through the capacitor and you will have to replace it.



rypical cooter circuit at left is marked "O," "S" and "G" to indicate where to make tests for opens, shorts and grounds. Hook up the tester as shown above for each type of check. Because circuits vary, be sure to check these trouble spots against your own wiring diagram, too.

appliances are plugged into the same circuit. Then check the components where

trouble is indicated, like this:

Fun motor. Check for free shaft rotation. If a fuse has been blown, test for shorts across the motor terminals first. with the power off. If no fuse has blown, test with the unit turned on for voltage at the motor terminals. If the motor is shorted or won't run, it must be replaced or rebuilt.

When the test light indicates no power at the motor, trace the circuit to the switch. Power into, but not out of, the switch means you have a bad switch.



GAS LEAKS ARE SNEAKY because Freen is colorless and odorless. But oil in the coils can be a giveaway. If you suspect a leak, check all tube joints for oil deposits or bubbles.

If the fan motor is of the capacitor type, test for grounding, as shown in the photos. When the compressor is the suspect, check in this manner:

Room-temperature thermostat. Adjust temperature dial to the coldest setting. With power off, test for a possible open circuit across the terminals. If the bulb fails to light, replace the thermostat.

Compressor capacitors. For safety, discharge the capacitor by shorting across the terminals with the shaft of an insulated screwdriver. Then remove the wires and check as shown in the photos. (Some models have only one capacitor).

Compressor-overload thermostat. The thermostat must be cool to the touch before testing. With power off, remove

the wires and test for possible open circuits between No. 2 and No. 1 terminals and between No. 2 and No. 3 terminals. If the bulb fails to light in either case, replace the part. On two-terminal thermostats, make a single test.

Compressor motor. With power off, remove the three leads from the terminal block and test for shorts as shown on the wiring diagram. Scratch paint off the housing to get a good ground and test all three terminals for possible grounds. Then test for possible opens in both starting and running windings. If the unit fails any test here, have a serviceman verify your findings.

The compressor-starting relay (some models don't have one) is a bit difficult to check. If all other components check out, on three-terminal relays disconnect the wires. Place the tester clip on the common or "L" terminal. If the bulb does not light when the prod is touched to each of the other two terminals, it is safe to assume that the relay is bad and must be replaced

Resistance heaters that fail to heat on year-around models should be checked for shorts and open circuits and replaced if the thermostat switches that control them check out okay.

Reversing-valve solenoids are prime suspects on year-around models when the system remains in the cooling cycle. Check for a possible open in the solenoid and for voltage at the terminals. Shorts are hard to identify. A serviceman can verify the trouble and replace the unit if necessary.

Refrigerant troubles in the form of leaks can often be spotted by examining all connections and brazed joints. Hold your ear close to the capillary tube to detect partial restrictions. The normal "gurgle" will be replaced by a "hiss."

A partially plugged refrigerant strainer can be suspected when the inlet feels considerably warmer to the touch than does the outlet.

Little or no noise in the capillary, little or no room cooling and a condenser coil cool to the touch usually mean bad or broken compressor valves.

Because it is necessary to recharge and seal the system carefully whenever a portion of the refrigerant circuit is replaced or removed for service, gas troubles are jobs for a serviceman,

# Replacing Glass in Metal Sash

# fix-it file



# Measuring for new glass and marking the frames



EXACT fit is important when new glass is cut. For a rigid frame such as this corner-staked one (note tiny punched indentations), measure from outside edge of opening. If frame



comes apart, it's easiest to measure first. Sometimes old glass can be measured. Before taking apart a frame, mark corners (above) for matching them in later reassembly.

# What to do when frames don't come apart

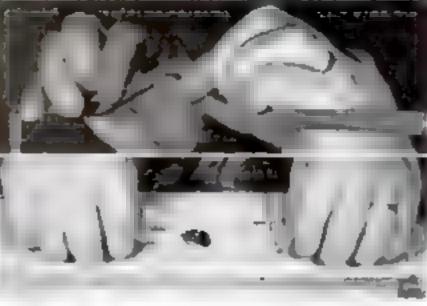


A PLASTIC MOLDING such as you see in use here is a common means of holding the glass in a metal frame, although you'll also find putty and glazing compound used. After frame has been brushed clean, apply a bed of glazing compound as in left photo above. The glass will smooth out mastic when pressed into frame. Then push plastic molding strips into groove as at right. Use new molding if old strips have deteriorated.

# What to do when clips retain come-apart frames



POP THE CLIPS OFF with a screwdriver and dismantle four sides of frame. Then, if window is so equipped, wrap subber molding around new pane. Push one section of frame



channel on edge of glass, then an adjacent channel as in lower photo above. Attach corner clip, and proceed to other sides. Reshape clips if they are bent in removal.

# How to work on the knock-apart sashes



L-SHAPED CORNER RETAINERS mean knocking out one side of frame. If retainer is exposed (left), drive it out with a blunt punch. If hidden, hammer against inside edge of channel, using a wood block. Then, put molding

on new glass and slide into frame (center). Start retainers into their grooves and gently seat the channel with alternate taps at both ends. If frame feels loose around glass, centerpunch indentations at corners.

# Hints about frames held by rivets or screws



IF CORNERS ARE RIVETED as above, remove channel from one edge by punching out rivets on two corners. Examine rivets first and punch out from small end. Install glass as shown for the knock-apart frames above. SHEET METAL SCREWS allow all corners of this type to be taken apart. Note how corners of new glass must be coped to keep screws from breaking it. Apply mastic inside corner gussets before inserting the new glass.

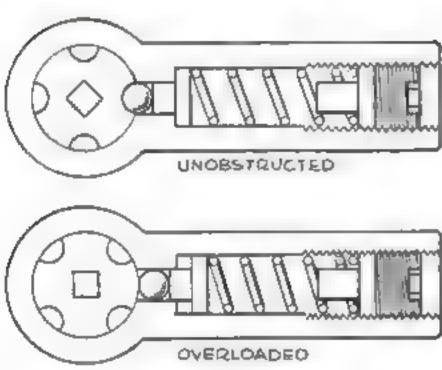




# Repairing Radio Vibrator

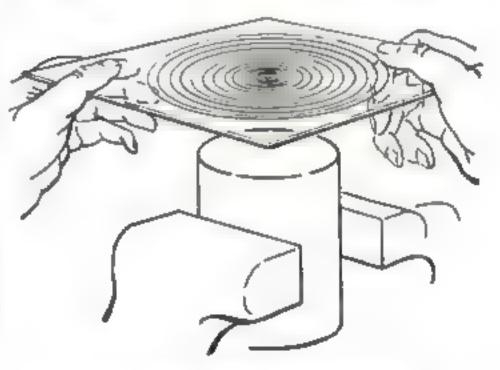
I have learned through long experience as a repairman of auto radios that the replacement most commonly needed is the vibrator.

This can frequently be salvaged. Saw carefully through the shell and lift off the cover so as to get to the contact points for filing and sanding lightly. Then tape the cover back in place. Be sure not to let the blade penetrate so deep that it cuts the points.—Joseph Currier, Aspen, Col.



# Torque Wrench for Small Taps

To avote overloading and breaking small taps, I made a wrench with springloaded hollow handles. Ball bearings are pushed by the springs into dimples in the edge of a round chuck. If a tap hits an obstruction, they press back into the alceve and tension is removed. Torque limit is adjusted by threaded pluga.—
Federico Strasser, Santiago, Chile.



# Finding the Center of a Hole

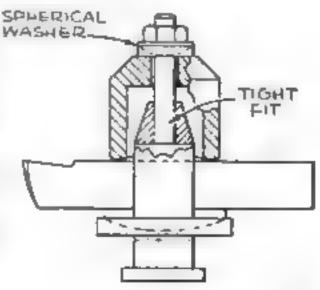
LOCATING the center of a drilled hole, or round stock, is easy with this tool. You can make it by drawing concentric circles on a 5"-by-5" sheet of clear plastic. Scratch the circles \(\frac{1}{3}\)" apart with dividers. Match the outline of one of them with the rim of the hole, and you will be able to spot its center automatically.—

Peter Barna, Wilmington, Cal.

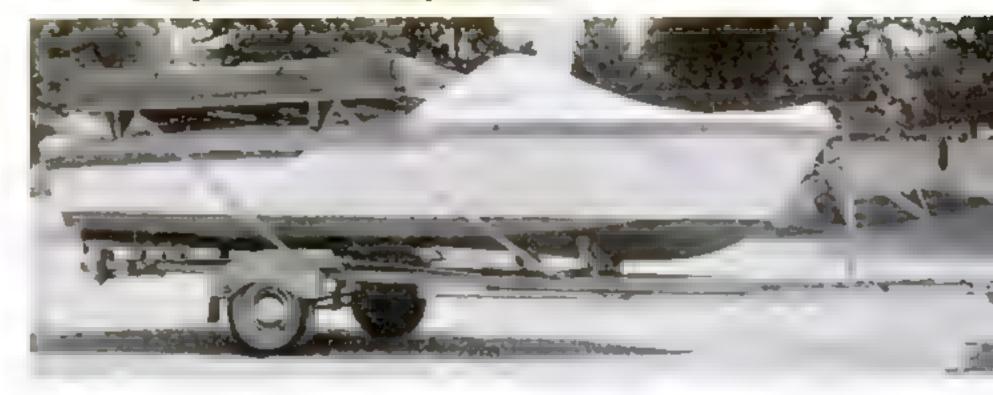
# Rigid Tool Clamp for Heavy Cuts in Lathe

HEAVY cuts in the lathe are likely to deflect the tool because of the distance of the point from the center of clamping pressure. You can avoid this with a sleeve that applies the pressure closer to the tool's point and near the ends of the rocker base.

Replace the tool post screw with a tight-fitting stud made from heat-treated alloy steel, but leave plenty of clearance in the sleeve so it will allow space for angular setting of the tool. Use a spherical washer under the clamping nut.—F. Murray, Chicago.



1 while you're rolling along the road, the tent and platform rest atop the boat.



For real convenience and carefree weekends, you're sure to like

# The Tent That Rides on a Boat

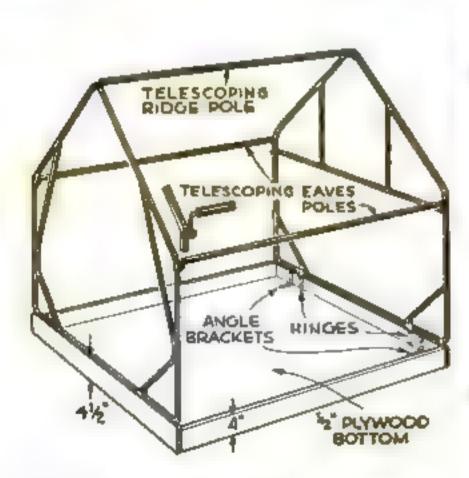
By Gordon F. Manning

HIS could be you:

Home from work on a fine Friday summer evening, a weekend of fishing and water skiing looms big. Your

favorite lake is too far away to reach that night, but that doesn't mean you have to cheat yourself of precious hours by waiting for a crack-of-dawn start.

"Let's go," you say to your wife. She, having detected that come-out-





OPEN FRONT END OF RAISED TENT shows hinged-steel end frame. Ridge and eaves poles are the only detachable parts of the rig.

38 POPULAR SCIENCE AUGUST 1959

2 for overnight stops enroute, raise tent in 60 seconds—and bed's ready.



doors glint in your eye, already has packed a picnic basket and is stocking up the portable refrigerator. You hook the boat trailer to the family bus, toss in swim suits and the gear for an aquatic spree.

As you drive and the daylight hours dwindle, or you feel tired, you pull into the first turnout along the road. Walking back to the trailer, you unsnap the canvas cover on the flat package on top of the boat. Swing up two end frames and a tent is raised; hook in a ridge pole and two eaves poles. Bedding is made up on the ½"-plywood floor. Your sack is ready in minutes.

At sunup, between yawns, you fold down the tent, snap on the cover, and get under way in a hurry. Munching a breakfast sandwich as you drive, you've already stretched out your weekend. No time-consuming making and breaking of camp; no hunting for motels with a vacancy.

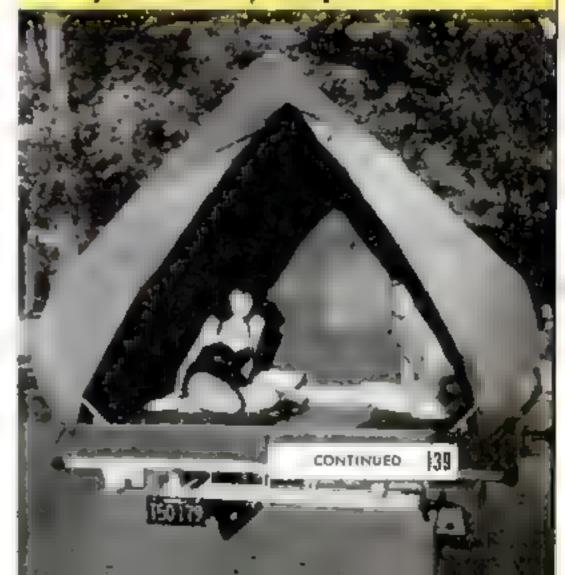
Arriving at the lake, you back down the beach to the water and winch up the tent platform on its two U-shaped car3 when you reach your destination, lift the platform, and launch your boat.

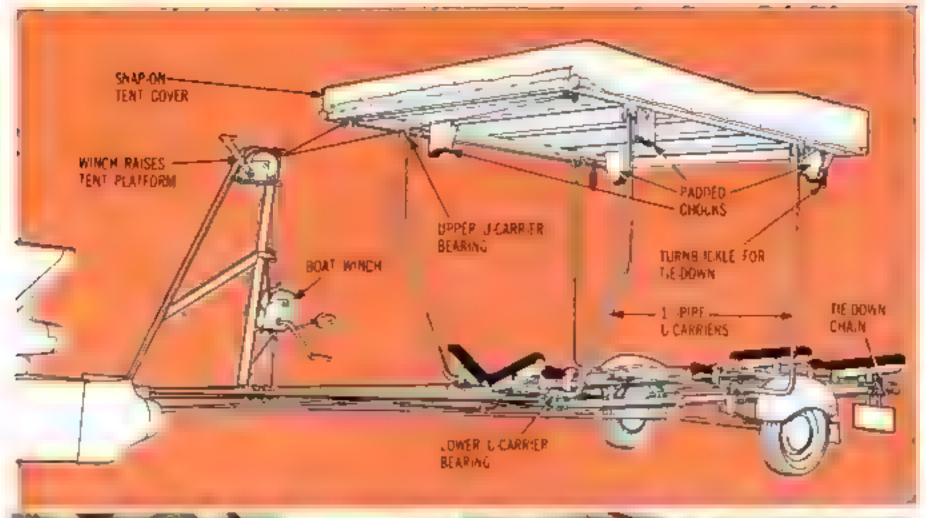


4 during your stay on shore, tent and platform are lowered like this for ...

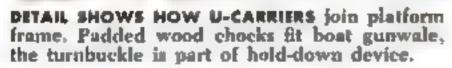


5 ... the answer to the crowded motel situation—park trailer, sleep in tent.











U-CARRIER GEARINGS ARE FASTENED to trailer frame by U-bolts. Carriers are 1" pipe, bent to shape. Cap screws keep them in position.

riers to give the boat clearance. Then, after the outboard has been launched in the normal way, with its own winch, you pick a choice parking spot, lower the platform to the trailer cradle, and put up the tent as you did the night before.

By the time the latecomers get there, you have camp all snugged up and are out on the lake fishing.

This can be you: because the two young men from Agawam, Mass., who thought up the "boatent," and hope to produce it commercially, have ironed out the bugs. Bill Gile, a high-school shop teacher, and Maurice Nelson, a civil engineer, each built an individual rig to fit

his own boat, and put them through three summers of road and camp testing.

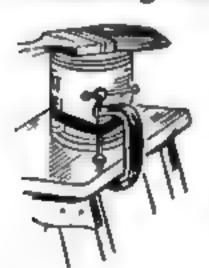
One of their problems was shrinkage of their standard seven-foot-square wall tents. The canvas ripped when it became too taut over the rigid steel framework. Now they have spring-loaded, telescoping eaves and ridge poles that have four inches of play. As the tent shrinks, the poles shorten.

Another road-tested device holds the tent package securely down against the deck of the boat while traveling over the roughest of roads. Two turnbuckles, one on each side, are attached by short chains to the trailer.



FIGURD an easy way to stop a toilet flush-tank inlet valve from leaking. I removed the valve assembly and applied several coats of rubber cement to the valve face. Then I replaced the assembly while the cement was still tacky. The rubber filled pits in the valve seat and formed a durable leakproof surface on the washer.—Carl L. Beddig, Oakland, Cal.

# Anchoring Paint on Ladder



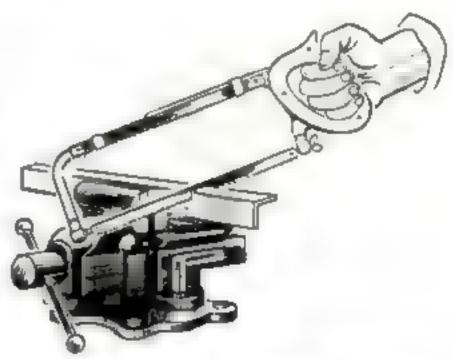
A PAINT can will be safe on the top of a step ladder if you hold it with a C clamp. Stretch a heavy rubber band over the can and run the screw through.—

Daniel Bousha, lack-son, Mich.

# Short Cuts and Tips

# Towel Rack in a Cabinet

IF you don't like towels hanging in the kitchen, you can build a rack that will slide in and out of a cabinet. Make a rectangle of 1"-by-1" stock and bore paired blind holes in the ends to take three or four stainless-steel rods. Assemble with glue and mount on cleats in a base cupboard. Holes in the upright piece behind the toe space provide ventilation--J. L. Wilson Jr., Binghamton, N.Y.



# Storing Spare Hacksaw Blades

A CONVENIENT way to keep spare hacksaw blades is to tape them to the top bar of the saw frame. You can then be sure of having an extra handy if one should break while you are at work on an outside job. —N. S. Steigman, Howard Beach, N.Y.

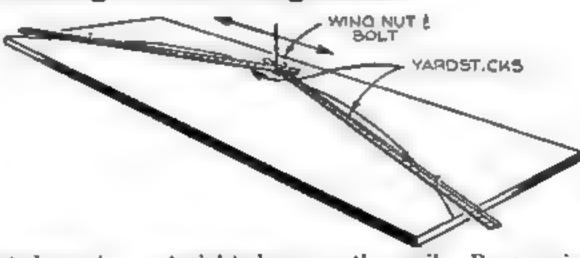
# How to Lay Out a Curve Having an Extra-Long Radius

IN BOATBUILDING and cabinetmaking you are often called upon to lay out large-radius arcs.

You can do it easily with two yardsticks or battens held together at the ends with a small bolt and wing nut.

Drive in nails at two

points and clamp the straightedges at a suitable distance from the chord. Then, with a pencil held firmly in the angle of intersection, draw the arc by sliding the



straightedges on the nails. By varying the angle between the two sticks, you can makes arcs of shorter or longer radius.—

James D. Chapman, Memphis, Tenn.

To be a good neighbor, and remain one, here's what you should know about

142 POPULAR SCIENCE AUGUST 1959

# Keeping Line Fences Within the Law

By William B. Eagan

Down in Louisville, Ky., immediately after a man built a stockade fence 10 feet high around his lot, the zoning board ordered him to remove it. His neighbors had protested, and the law was on their side. Local zoning there restricts fences to a four-foot height.

Fences are a prime source of neighborhood feuds. Every day courts are passing judgments on such controversies. At issue may be a state law, a local ordinance, a zoning decree or perhaps a special restriction in the deed and covenants applying to a particular piece of property.

Strange legal quirks. Search out all restrictions. For instance, did you know that:

• In most communities, you can be found guilty of trespass if you build a fence exactly on your property line?

 You can be held hable for damages if someone should hurt himself on your fence?

 You can be forced to share the expense of mending a fence belonging to a neighbor whose land adjoins yours?

You can run afoul of the law by erecting a fence that impedes natural water drainage or that merely restricts the view of your neighbors?

Ignorance of the law is no defense. This holds true in fence cases as in other legal hassles. Take the case of poor Harry M. who moved into a brand new home in Cincinnati. To safeguard his children, he decided to fence the back yard.

Finding that his property line split the middle of a shallow drain ditch between his yard and his neighbor's, he set his posts in the center of the ditch. When the fencing was complete, he filled in the half of the ditch on his side, level with the rest of his yard.

During the first heavy rain, the ditch overflowed on his neighbor's yard and

flooded his garage.

Harry M, refused to pay damages since he regarded one half of the ditch as his own to do with as he liked. The court saw it differently. Harry had to pay for the damage. He was also warned to relocate the fence and to restore the filled ditch to its previous shape and size.

What law had Harry broken? A very old and simple one, yet surprisingly not too well known. You can't alter the natural contours of the land in any way that affects a neighbor's property. This is so even if you do the job on your own land.

The question of repairs. John T. in another state was even unluckier. He bought several acres of country property as an investment. It was fenced in, but the fence needed repairs. Soon the owner of the adjoining land submitted an estimate for repairs to John and asked him to pay half. John refused.

The county trustee warned John to pay, but he refused. What happened? The county had the repairs made, then added the cost to John's tax bill

John couldn't win. A state law required that all fences be set on boundary lines, automatically making them the joint responsibility of owners on each side.

NO MAN'S LAND between parallel fences starts fights, looks silly, wastes land and may be illegal. But, in some cases, a

setback fence may be the only answer to a grouchy neighbor. the-line fences aren't permitted because of the legal battles that often result. Many communities now forbid shared

driveways for the same reason.

No barbed wire. Often an illegal fence will go unnoticed until something happens. An Indiana homeowner hurriedly erected a temporary barbed-wire enclosure to keep out roving dogs until a more expensive fence could be built.

Everything was fine until a child chasing a ball fell into the barbed wire and was badly cut. The child's parents sued, the town suddenly lowered the boom, and the homeowner had to pay a steep price for his "cheap" fence.

Barbed wire, similar sharp-pointed designs and electrically charged fences are almost universally outlawed nowadays. One exception: A fence topped with barbed wire is frequently legal for guarding such hazards as swimming pools.

Know your boundary lines. Another homeowner very carefully set his fence on what he thought was the inside edge of his property line. A resurvey made by a new owner next door showed the line to be 2" off, and the new neighbor got a fine fence free. A more ornery newcomer could even have had the fence removed—and kept the materials himself.

If you can't locate surveyors' markers, better have a new survey made.

Consult your neighbors. Because fences

# Three ways in which the unwary



JOE LOST A BRAND-NEW FENCE when he found he couldn't paint it without trespassing on his neighbor's land. He should either have obtained an easement or built it farther back.

are automatically interpreted as "Keep Out" signs, neighbors can be offended easily. Law or no law, it's a good idea to get your neighbor's consent to a fence. And it's a still better idea to get all agreements in writing.

George and Charley were great nextdoor pals, so when they decided that a fence would look nice between their houses, they had no problem in agreeing

to share the cost and upkeep.

Then George's office was transferred to another city and he had to move. Charley's new neighbor not only balked at

# Quick Answers to Trick

If my neighbor erects a fence on my property and I do nothing about it, would the land on his side of the fence become his?

Yes. If you permit an encroachment for a length of time specified under local law, he can take title by a process called "adverse possession."

If my neighbor gives me verbal permission to build a fence half on his side of the boundary, can he make me remove it if he changes his mind later?

A Not if you can prove he said it and the court rules that an "irrevocable license" has been created. But verbal agreements are hard to prove. To be

safe, better get it in writing and have it recorded in both of your deeds.

If I find that a fence encroaches on my property, can I remove it myself?

Yes, provided the location of the fence has not already been established by an easement or some other agreement. It's best, in any case, to consult your neighbor first and try to get him to remove it.

If my neighbor and I have shared an on-the-line fence by formal agreement, and he now wants to remove the fence, can he do so without my consent?

A No. But you may have to buy his half of the fence to prevent its removal,

44 POPULAR SCIENCE AUGUST 1959

# fence builder can get into trouble with the law



BOB WAS SUED FOR DAMAGES because his fence, blocking the view at an intersection, caused a collision. Usual rule. Half a fence's total area must be open for good visibility.

paying his share of the maintenance—he wouldn't even let Charley come over on his property to paint it.

Even if the fence is on your side of the boundary line, remember that it's impossible to work on the other side of it without trespassing on your neighbor's property. Agreements to share costs, and casements to allow you in the other fellow's yard, should be recorded right in the deed to each owner's property. Even written agreements expire as soon as either party moves away unless they are made a permanent part of both deeds.



Jim's HEDGE WAS A FENCE in the eyes of the law. He had to tear it out when he learned, too late, that he had planted it on public property—right where a new sidewalk was to go.

When Bill moved into a small eastern town, he found his property already partially bounded by a neighboring fence. Instead of building a whole new fence, he received permission to extend the existing fence, offering in return to pay half its original cost.

Bill thought this gave him title to half of the fence. It didn't. When his neighbor moved away, the new tenant politely suggested that Bill could either "buy" the fence over again or take down the part that entered the neighbor's yard. Bill [Continued on page 206]

# Questions About Fences

I made the mistake of erecting my fence on my neighbor's property. What can I do?

You can try buying a strip of land from him or ask for an easement. Otherwise, he can have the fence removed.

My neighbor has erected a 10-foothigh fence, Can I make him lower it?

Yes, if it is higher than local restrictions allow or blocks your natural view. Consult your zoning board,

My neighbor and I have parallel fences and he refuses to keep his part of the center strip clean and mowed. Can I force him to do so?

This depends on local building and health codes. Proper maintenance is required by some, not by others.

Recently a car damaged my fence.
Can I make the owner pay for repairs?

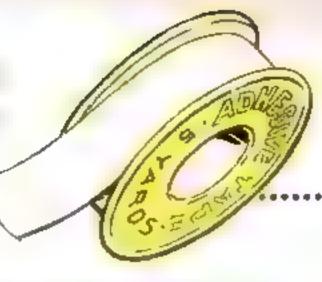
Yes, if your fence isn't on the road right-of-way and thereby a hazard. You'll have to sue him, though, Local laws set rules, but do not settle claims.

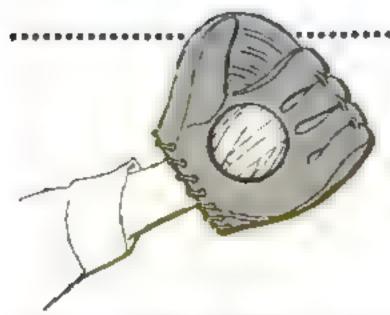
I built a 10-foot-high privacy barrier in my back yard. Would this be considered a fence?

A Not unless it is on or near a property line. However, it may be subject to other building restrictions.

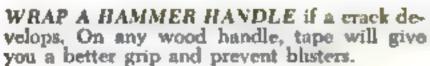
Bonus from the medicine chest:

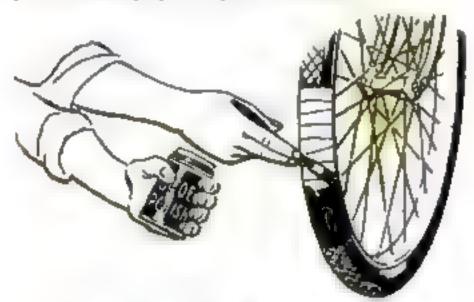
7 Extra Uses for Adhesive Tape





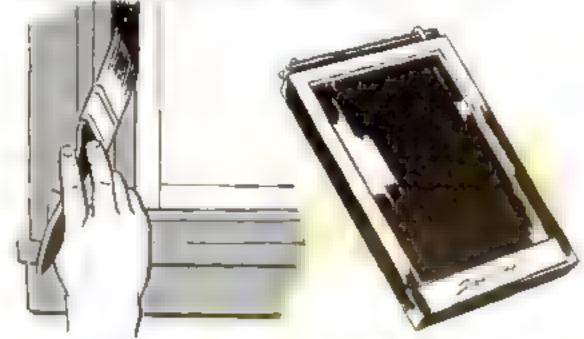
COVER OF JUNIOR'S BASEBALL about to come off? Wrap it tightly with adhesive tape and the ball will be almost as good as new.





A BICYCLE TIRE that has worn through to the fabric can be saved. Wrap tape tightly around the tire, apply black shoe polish, and you have a "recap" good for emergency use.

APPLY IT TO OUTLETS near the floor if you fear a youngster may stick in metal objects. Paint it to match the faceplate color,



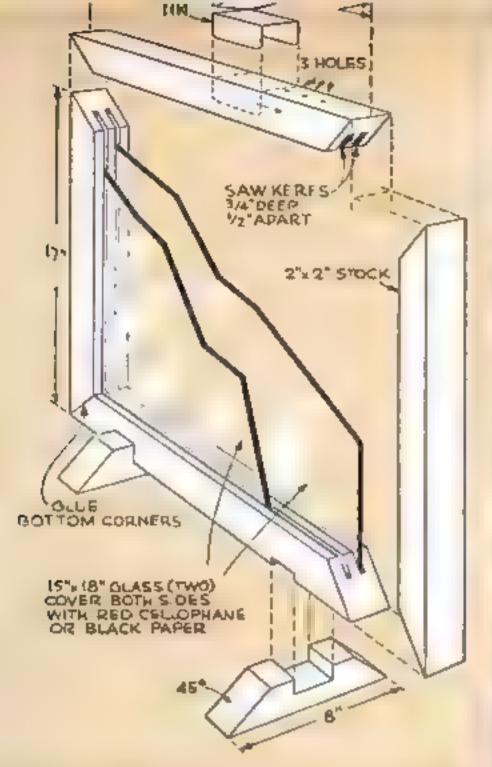


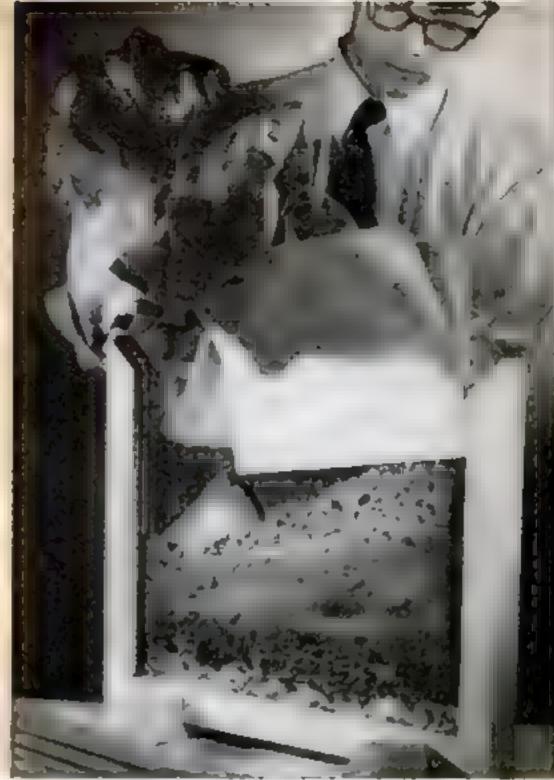
FOR SMALL PAINT JOBS, such as window sash, a strip of adhesive tape works fine as a masking-tape substitute. For fine stripes, place two strips close together and paint between them.

A FILM HOLDER can be marked by applying a thin strip of adhesive tape, then writing the negative number on it. Use similar tabs on 35-mm, negative cartndges.

BEFORE DRIVING A NAIL into a plaster wall, cut off a short length of tape and press it against the spot. This way the plaster beneath it won't crack or chip out.

46 POPULAR SCIENCE AUGUST 1959





MATERIALS YOU NEED for this ant house are an 8'-long two-by-two and a pair of 15" by 18" panes of glass. Glue and nail bottom corners; leave top frame member free for access.

A FILE FOLDER acts as an effective funnel for emptying a collecting bag of ants into the house. House is then kept in dark several days to let ants get accustomed to the new home.

IVE o'clock, and the city's office workers descend from the sky-scrapers, vanishing into the subways below the metropolis.

A few miles away, also underground, similar events are mirroring the city in miniature. A colony of ants is preparing for the night.

Next to man, ants and bees have developed the most complex society on earth. And some scholars place man second.

Keeping ants for study has become increasingly common, largely because of the ant houses or "palaces" now being sold in dime and department stores.

You can use many types of containers. The main thing is that they permit the ants to be seen, yet keep them in their place. A screw-top jar with holes punched in the lid will work. Or better, a picture

frame, nailed flat to a board with glass resting on top makes observation easy and provides access.

Another type can be made by placing one glass baking dish inside a larger one and pouring water into the space between. The dish should be divided into four or five rooms with walls (and little doorways) made of a material such as molding clay. One or two of the chambers should be kept dark. Dirt isn't necessary. However, the absence of earth, though making for easy observation, does not allow the viewer to watch an interesting activity—tunnel excavation.

The most satisfactory ant house in my experience, however, has been a large double-glassed affair easily built with woodworking tools. First, make two lengthwise cuts 3/4" deep and about 1/2"

[Continued on page 208]

# FOR THE HANDYMAN Outdoors

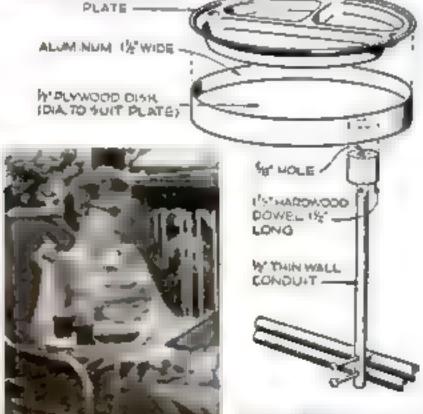


RAIN WATER FILLS THIS POOL. Filling our pool would be too much drain on our well. So each spring we fill it with rain water from the roof, then start the filter system operating.—John Mihalick, East Liverpool, Ohio.



DIVIDED ALUMINUM

an OLB WASHTUB makes a perfect hose hanger and rag bin, with a useful shelf to boot. Here's mine, conveniently located on the garage wall.—Thomas P. Morgan, Washington, D. C.





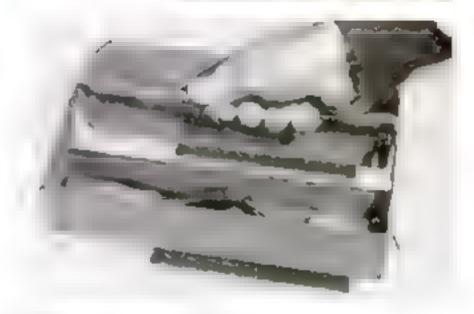
spiken shoes in the Living ROOM? Sure—with these sneaker pads. Make them from a pair of women's thick-soled beach clogs. Press the spiked shoes down on white cardboard and shape the cardboard to the shoes to get patterns for adapting the beach clogs. Put a pattern on each beach clog and drill holes for the spikes. Also drill holes for insertion of shoe laces from side to side to hold on the pads.

REFRESHMENT TRAYS attached to outdoor furniture like this are very convenient. Cut the plywood disks to suit the plates or trays that you select. Glue the dowel to the underside of the disk in an offset position—about 3" from the edge.—W. G. Waggoner, Sacramento, Cal.

54 POPULAR SCIENCE AUGUST 1959



# Short Cuts and Tips



# Door-Top Safe Hides Jewelry

When my wife asked me to price a wall safe for her valuable jewelry, the cost drove me to ingenuity. Instead of paying out cash, I chiseled a 1"-by-4" recess 2" deep in the top of a closet door—room for a necklace, rings and small pieces. With the door closed and locked, they are safe.—John A. Comstock, Wellsboro, Pa.

PLIERS cost money. You can save the ones you have by periodically servicing them with a slim taper file. Work the file through each valley between teeth to restore gripping power. Clean with a wire brush.—M. Robert Beasley, Jackson, Mich.

#### Handy Tool-Carrying Kit

The dirt-collecting troughs from a discarded carpet sweeper make a convenient toolbox for taking to a job outside the shop. All you need do is disassemble the sweeper, remove the troughs and clean out the dirt. They are joined in a single piece. The rod at the top will serve as a handle.—Hi Sibley, Nuevo, Cal.

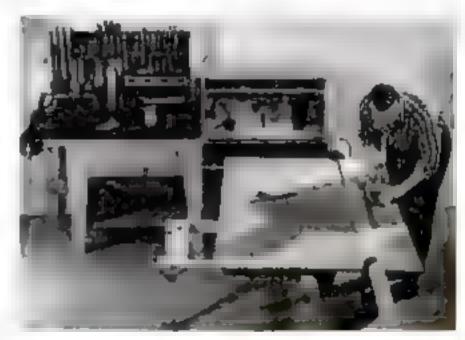
▶▶▶ IF A medicine-cabinet door backs up against its shelves, the silvering is likely to wear off in streaks. I solved the problem by applying adhesive tape to the mirror along the contact points.—
Leonard J. Dobucki, Frederick, Md.

Coming in September . . .

# The Popular Science Split-Level Workbench

A STAND-UP work surface and a lower level to sit at when tinkering . . . Plugged-in power-tool storage—the tools always ready for instant use, yet always under lock and key . . . A pull-out utility table for use as sawhorse, gluing table or general assembly . . .

You'll find all this and more in the upto-date work bench designed by the editors of Popular Science Monthly especially for modern power tools. A large, detailed blueprint folded into the September issue will show you how to build it.



# Pushbutton Controls for Garage Doors

# By George Daniels

A MECHANICAL muscle to open your garage door used to be considered a wonderful bit of super-gadgetry.

Today, mass-market builders are installing pushbutton door openers in development houses as standard equipment. Like the "free" dishwasher or food freezer included with every house, their appeal to buyers is worth many times more than their cost.

Two popular misconceptions that may have helped to keep this from happening sooner are that automatic controls are hopelessly complex electronic devices, costly at best and temperamental at worst. Neither is true.

While radio controls are among the fanciest and most expensive, they are by no means the only type you can buy. Much cheaper—yet less well known—is

the simple switch type, mounted carwindow high on a post at the entrance to your driveway. As you turn in, you just reach out and push a button.

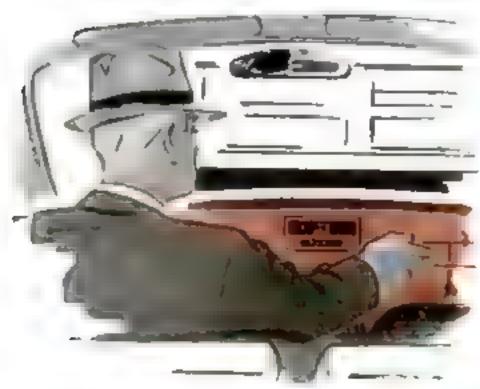
Better and cheaper. Today, you can have a completely automatic garage door for the price of an ordinary household appliance like a refrigerator. For as little as \$100, you can add an automatic control to any existing door.

Some earlier models with the habit of responding to dog whistles, car horns and squealing brakes have either been taken off the market or made foolproof.

Should you buy one? The sheer luxury of driving home on a cold, stormy night and watching your door swing magically open before you may be justification enough for parting with the purchase price. If it isn't, doormakers offer further inducements.

You'll be spared 3,000 trips in and out of your car and 29,000 steps a year,

# Four ways you can command your garage door to open magically



RADIO CONTROL, actuated by a button on your dash, enables you to open your door without stopping or slowing down. One of funciest, it is almost foolproof against accidental opening by other cars, is also one of costliest.



KEY SWITCH at entrance to driveway is the cheapest control you can have, but you must stop your car to operate it. Because many openers use low-voltage wiring, the bookup of switches is safe and easy to do yourself.

156 POPULAR SCIENCE AUGUST 1959



NEW REMOTE CONTROL is this tiny battery transmitter that flips open a garage door from any car or anywhere around your house or yard, it's available from suppliers of door operators such as Alliance Mfg. Co., Alliance, Ohio, and Edward T. Fink Co., Yonkers, N.Y.



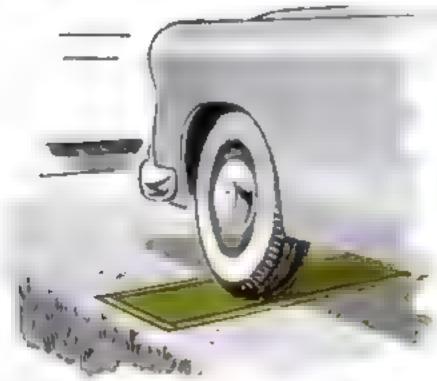
figures one company. You'll stay healthier because a self-powered door keeps you out of the rain and snow. Your fuel bills will be lower because an automatic door is open only a few seconds a day, while human laziness may leave a manual door open all day long, wasting heat.

Some of this is nonsense, but the fact is, automatic doors do make sense. Many new models will turn on a light for you as well as open the door. If you have a steep driveway that ices up badly in winter, a remote-control opener may be the only way you can get a running start and reach your garage without stopping.

You can have any control you want. The muscle that moves the door is the same no matter what system you select to control it. This is an electric motor of 1/6 to 1/3 hp., geared down to drive a chain or cable that pulls the door.

Since any of several systems can be

# at the touch of a switch without even getting out of your car



PRESSURE-OPERATED TREADLE buried in your driveway is next cheapest to a key switch and makes it unnecessary to stop your car. But it can be operated by any cars—including daily delivery trucks—that enter your driveway.



FLECTRIC EYE, or photocell, is mounted on the front of the garage and tripped by flicking your beadlights in a pre-set code. It's less expensive than a radio control, but can't be triggered any farther away than your beams.

# Plug-together parts let you combine any "brain"

used to trigger the motor, this means that you can start out with a switch, then add a radio control later. You can also combine controls. You can have a dashmounted transmitter, for instance, plus a switch inside your house and maybe another in the yard so you can open your garage even when your wife has the car downtown shopping.

Most standard openers are designed for upward-acting doors, either the sectional or one-piece tilt-up type. Special hookups can be rigged to operate swinging doors, but as these are costly, it's usually best to install a new door. Single tilt-up

doors start as low as \$56.

Prices for door operators alone—motor, hardware and a switch control—start around \$100, average about \$140. Most newer units include a safety switch that automatically stops or reverses the door if it strikes anything while closing. Be sure the one you select has this precaution to safeguard children or pets that might be in the way.

In-the-car controls. Most popular type, despite its higher price tag, is the radio control. This consists of a receiver in the garage and a transmitter operated

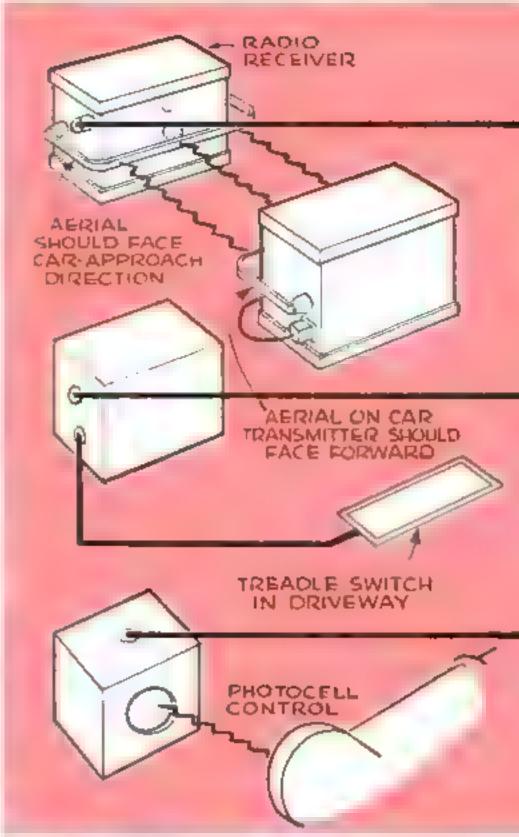
by a pushbutton on the dash.

Radio controls—including receiver and transmitter but not the actual door operator—range from \$80 to \$100, with a few as low as \$50. Where more than one car will operate the door, additional transmitters are needed at an extra charge of about \$25 a car.

New this year is a small pocket-size transistor transmitter that runs on hearing-aid batteries. Not wired to your car, it lets you open your garage door from any room in the house, anywhere in your yard or from any car that you may be driving—merely by reaching in your pocket and pushing a button. These cost about \$37, not including the receiver.

Keeping out strays. Two major improvements have been made in radio controls to prevent their being accidentally triggered by unwanted signals.

Instead of operating on a single broad band, most new units give you a choice of up to 200 different signal settings so that you and nearby neighbors can each zero in on your own garage without affecting others. At the same time, re-



typical setup shown at right. Into it can be plugged any of several "brains"—pushbutton controls—such as the radio, treadle switch or photocell above. When a brain tells the muscle

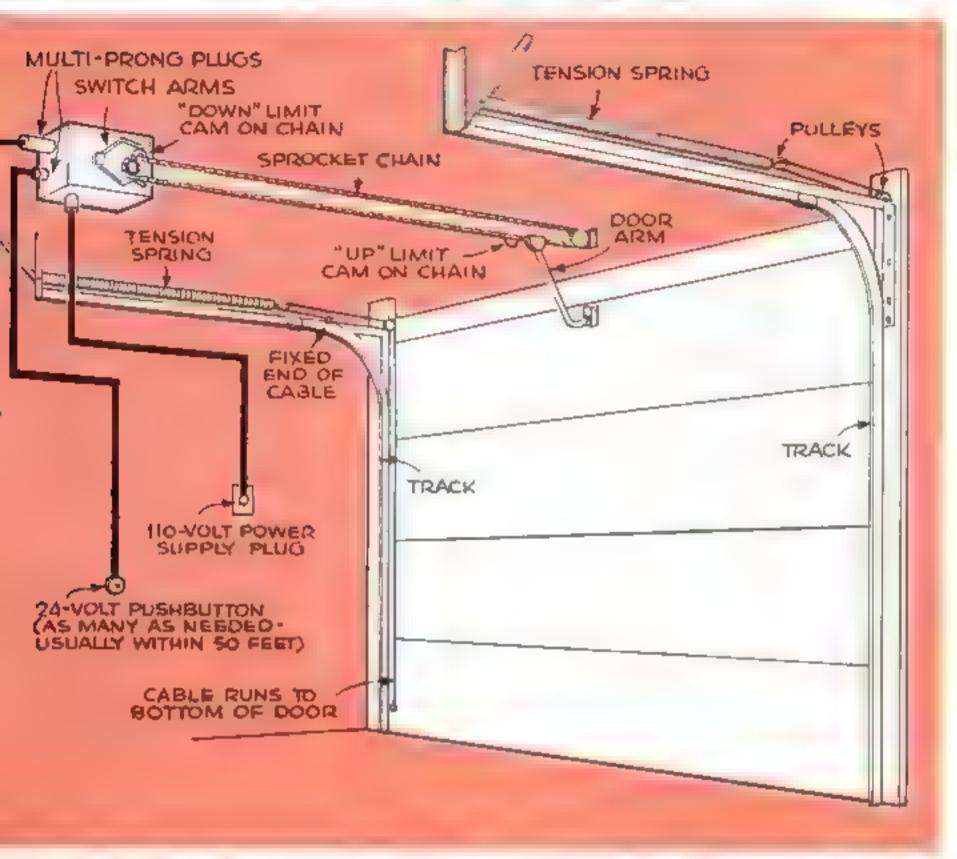
ceivers have been made less sensitive so they won't pick up stray signals.

The big advantage of a radio control is that it also keeps out intruders, not possible with most other control systems. Only you in your own car can open your own garage.

In case of a power failure, you can open the door manually, but you'll first have to go around and pull a cord or lever from inside the garage to disengage the automatic control. The drawback is that if your garage has no other entrance you'll have to mount the device on the outside, within reach of prowlers.

Timing your run. The range of a

# with one basic "muscle" to open your garage door



to move, the motor starts driving a chain (or similar linkage) that pulls up the door until an "up-limit" stop fastened to the chain strikes a switch arm on the motor. This automatically stops the motor and sets it for reverse rotation

radio control must be great enough to permit your door to be open by the time you reach it, yet not so great that it responds to distant signals. For this reason, the rule is to adjust the receiver so that its range just matches the distance required to give the door time to open.

Most doors open within five to seven seconds, but it's best to allow 10 for a safe margin. If you approach at 15 m.p.h. (22 feet per second), your control must start to operate at a distance of 220 feet.

The faster you drive, the greater the control range you need for a nonstop approach. Make sure that the unit you

so that the next push of the control button will close the door. The "down-limit" stop then shuts off the motor and reverses it again so that the next push will open the door and the cycle will be repeated as often as necessary.

buy has at least the minimum required range.

Cheapest control you can buy is a weatherproof switch mounted on a post at the entrance to your driveway, with an underground cable running to your garage. To make it burglarproof, you can buy a key-operated switch for about \$12.

A second switch inside the garage shuts the door after you and also opens it on the way out. The main thing you lack in a switch arrangement is the luxury of a completely nonstop landing.

Photocell control. This system has recently been improved to respond only

to a brief pre-set dot-dash code from the car's headlights, even in dazzling sunlight. But as code combinations are presently limited to about five, this type is sold on the basis of low cost rather than bank-vault security. Professionally installed, a typical photocell control, complete with electric operator, sells for about \$150.

Radar control. Highest priced of all systems, this type beams its signal from the garage to the car, where, at the press of a button, it is modified by a dimesized crystal and bounced back to a receiver also in the garage. Unlike most radio types, it uses an outside hairpin antenna, but it's practically as pickproof as a tumbler lock. Price for radar control and door operator, installed, is about \$300.

Off-beat controls. Two types of pressure switches are sometimes used. One is a treadle plate buried in the driveway (like the switches used on automatic traffic lights) that opens the door when the car is driven over it. As it is triggered by pressure alone, any car can operate it.

The other is the familiar hose often used to ring a bell in a service station when a car drives in. It's simple and inexpensive to install but it isn't selective, and children enjoy jumping on it.

Horn-triggered openers, one of the earliest systems tried, had the unfortunate

habit of responding to blasts from passing cars and have been largely abandoned.

Operating costs. Allowing radio receivers to run continuously may sound expensive, but actually they burn only about 12 watts, little more than the smallest night light. At average electric rates, this is about a dime a month if you never turn the control off, a nickel if you turn it off at night. The operator motors, running only one to three minutes a day, may bring the total cost to about 50 cents monthly.

Pro vs. do-it-yourself. You pay more to have your door and its operating equipment professionally installed, but you get a parts guarantee that may not apply if you do your own work. Some makers produce special kits designed for amateur work, complete with detailed instructions. Others flatly discourage amateur installation and may not be too helpful if you get stuck and are in need of advice.

Here's how the figures compare on a typical one-car sectional door:

1	Professionally installed	Homeowner installed
Door	\$ 85.00	\$ 65.00
Operator	150.00	120 00
Radio Control	75.00	50 00
	\$310.00	\$235.00

# Check your garage's vital statistics before you buy an opener

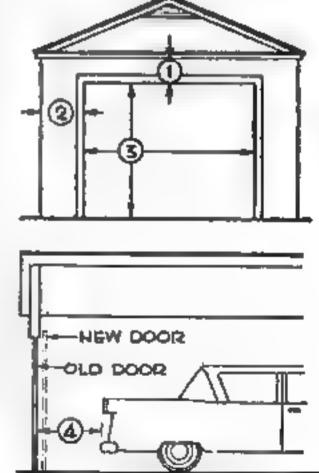
THE mechanisms that do the actual job of opening a door come in many types and sizes, some of which may not fit your particular garage. Check these four measurements before you choose an opener:

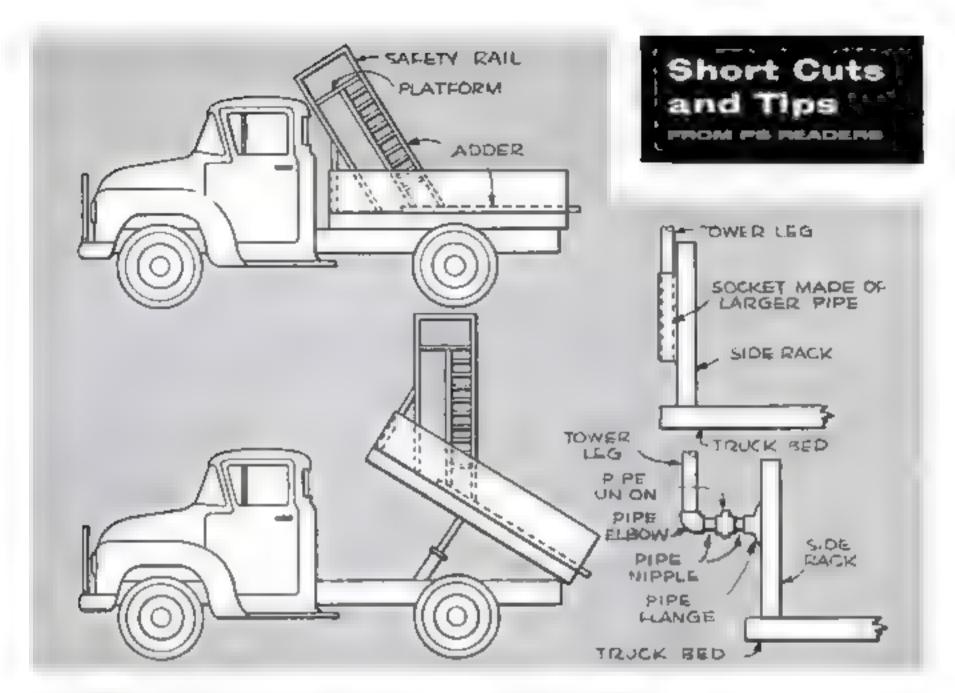
1. Headroom. Doors and operators may require as little as 2" from the top of the door opening to the ceiling or as much as several feet

 Sideroom from door opening to wall (or across the centerpost in a two-door garage). You may need 5" or 6" here (double this at a centerpost).

3. Size of door opening If you're short on headroom or sideroom, you may be able to reframe the door opening to gain more space. But be sure you'll have enough opening left for an adequate door.

4. Amount of clearance from the rear of your car to the present door. This is important to know if you're planning to add a new door as well as an opener. Upward-acting doors usually mount inside the position of old-style swinging doors, meaning you'll need 6" to 8" extra room to allow for this.

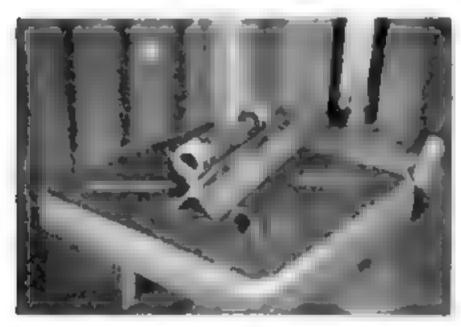




# **High-Working Aerial Ladder on Dump Truck**

WE NEEDED a rig to help with overhead maintenance work at Algoriac State Park, so we put an aerial platform on a dumptruck body. We built it of two-by-fours, making the forward legs shorter than the back so it would stand upright when the

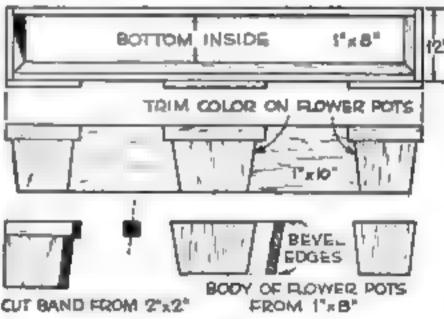
dump body was raised, braced it diagonally and bolted a ladder to the floor of the truck in order to reach it. It could have been made as easily from 1½" pipe and removed when the dump body was in use.—Carlton T. Althoff, Algonac, Mich.



# **Drill-Press Pipe Jig**

A SIMPLE jig that will hold round stock in place for drilling can be made from two 8" lengths of \(^1/8\)"-by-1"-by-1" angle iron. You should be careful in welding them together so that they form a perfect X. Then any of the four V's can be used for holding the stock while drilling.—

Arthur R. Tanner Ir., Poughkeepsie, N.Y.



# Pot Cutouts on Window Box

You can make window boxes from scrap stock and decorate them with cutouts that look like flowerpots. The bottom is slightly smaller than the top opening so the front and ends slant inward. Saw a two-by-two at the same slant for flowerpot rims. Paint in contrasting colors.

—Arthur N. Nelson, Kansas City, Mo.



# Sturdy Knockabout Stool

This stool was built eight years ago in the hope that it would survive the treatment numerous children had handed out to commercial articles with disastrous re-

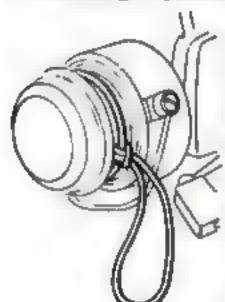


sults. It's still in active use, has had no repairs or maintenance other than an occasional painting. Its strength lies in the center spacer, nailed and glued to both legs, and in the

top. They keep the legs from racking. Another advantage is that the grain of the seat runs crosswise between the side rails, providing very rigid construction.

—Edward E. Thorp, Montelair, N. J.

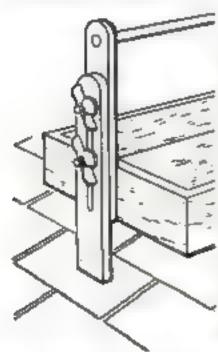
# Securing Spinner Line on Spool



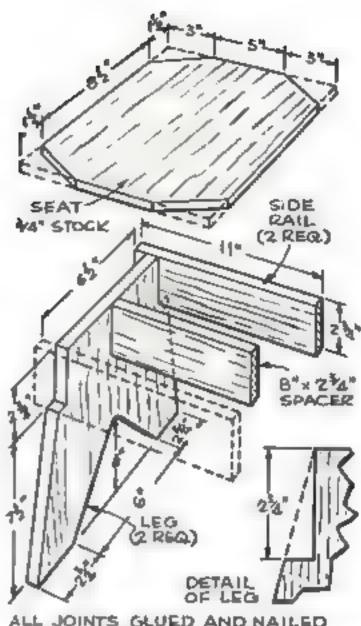
Two rubber bands looped together will keep a spinner line from unwinding on the spool when it is not being used.

Loop one of the bands over the spool; the other will act as a tab that can be grasped for removing quickly.—R. R. Rundell, Miami, Fla.

#### Toolbox for Use on a Roof



By ADDING an adjustable leg at one end of a toolbox you provide level support for it on any pitched roof. Slot the leg to fit over a pair of projecting bolts on one end upright. It is held by butterfly nuts when raised or lowered into position.—G.E.Hendrickson, Argyle, Wis.



ALL JOINTS GLUED AND NAILED WITH 2"2" NAILS 1" APART

#### From Shoulder to Camera Bag

WHEN the lady of the house discarded her leather shoulder bag, my son quickly retrieved it.

He has been using it since as a gadget bag for carrying his box camera. It has room for film and a flash attachment.—

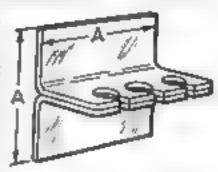
R. M. Woodbury,

Natick, Mass.

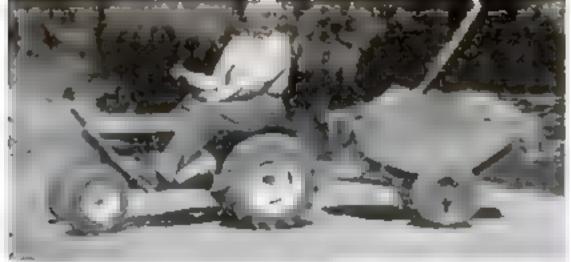


#### Built-in Tile Toothbrush Holder

If you are refinishing your bathroom walls with plastic tile, you can build in a toothbrush holder with two pieces of the same tile. Have



the dealer bend two of the tiles at right angles so that when you cement them together the flat sides will form a perfect square. When the bond dries, notch the projecting edge with a coping saw to hold as many toothbrushes as required.—Alice B. Peirson, Kennett Square, Pa.



HOW I BUILT A

Garden-Tractor

Dump Barrow

ONE of my most useful garden-tractor accessories is a dump trailer that I built for less

than \$65, using simple hand tools.

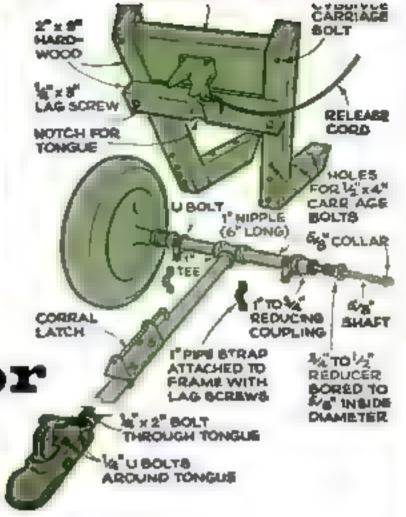
The hopper is a four-cubic-foot aluminum wheelbarrow bowl—a replacement stocked by many hardware stores. I attached this to a hardwood frame with eight carriage bolts. For the T-shaped trailer chassis I used galvanized pipe and fittings. The axle is a length of \(^5/6''\) shafting, shipped through the cross member. A pair of shaft collars fitted with setscrews hold the wheels in place.

A pull on a leather thong opens a corral latch, freeing the forward end of the underframe from the tongue. This makes dumping the barrow

easy.-R. B. Lewis, Menlo Park, Cal.

IN FULL DUMP POSITION, the rim of the wheelbarrow bowl rests on the ground. The quick-release trailer bitch is convenient, but a less-expensive clevis could be used.

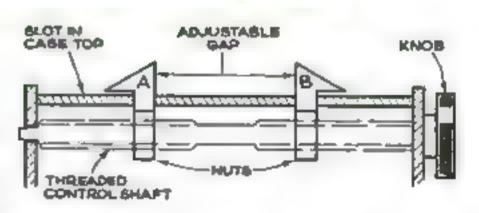
() 在文章, The Machine, 对由文章的文章, 图 () 在文章, The Call () 图 ()





# The Case of the Coarse-Threaded Vernier

EXPERIMENTER Joe needed a onebetween two small anvils A and B over a short range. This would have been simple with a screw having right-hand and left-hand threads, like a turnbuckle. But Joe's lathe was not the acrew-cutting type, and his threading dies were the common right-hand kind. He wanted delicate vernier control too, but the finest die on hand cut only 24 threads per inch.



Nevertheless, he used the tools available to make a control that changed the spacing by 1/48" per turn of the shaft. By marking the knob's rim, he could obtain adjustments almost as fine as one-thousandth of an inch. How did he do it? For the answer, turn to page 167.

# The Gremlins in Printed-Circuit TV

# By Art Margolis

Although printed-circuit television sets are fairly new, the odds are better than 10 to one that if you have a new TV it has printed wiring boards. They are easier to design and produce, and their circuits are compact and free of wiring errors. That's one big reason why your new set cost so much less than that old small-screen monster you may have relegated to the bedroom.

Repairing them, however, involves new techniques and the use of special tools.

# A Case of TV Surgery

ONE of my recent printed-circuit jobs ran parallel to a repair job a doctor had made on the owner of the set.

The poor guy, a preacher, had broken a hip. It was splinted together with one of those metal pins that pokes through the skin on either side of the fracture and holds the break in place with a metal member along the bone. Still in a wheel chair, he watched me in a big wall mirror as I worked on his set.

The TV was a new table model, loaded with printed-circuit boards. Its ailment—a smeared picture. My diagnosis—a loss of high frequencies in the video.

In a TV picture there are all ranges of frequencies from zero to mega (million) cycles. When a point in the frequencies goes from black to white, the change takes place in the megacycle range. And with a high-frequency loss, the picture smeared when trying to change that fast.

Special circuits with peaking coils are used to pass such high frequencies. The indication in this case was that the set had lost a peaking coil. First I checked all the peakers, mounted atop the video

printed circuit board, with my ohmmeter. They all read between the proper three and 15 ohms.

I decided to trace the wiring to the coils, and took an extension cord with a 60-watt bulb on it out of my printed-circuit kit. I lit the bulb and placed it behind the translucent printed-circuit board. The wiring stood out like a skeleton.

The preacher chuckled, "When the doctor fluoroscoped my leg I watched in a mirror, too. My fracture looked very like that skeleton wiring. See," he said, holding up an X-ray picture.

"Guess it serves the same purpose," I said, examining the wiring. There was a light spot on the lead that went to one of the peaking coils, "There's our fracture," I said, pointing. Then I took a piece of hookup wire and attached it to two points with some 60/40 solder and my small iron so the wire jumped the break. I turned on the TV. The smear was gone.

"Much like the way they patched my hip," said the preacher.

"Except for one small difference."

"Oh, what's that?" he asked.

"It won't cost you as much," I said, handing him a modest bill.

# The Case for "Sloppy" Work

PETE, my kid cousin, is developing into quite a TV trouble shooter. But he's always in a hurry and his work looks sloppy. I had tried to din neatness into him with the insistent repetition of a broken record.

One day I decided to teach him a lesson in reverse. He had a 21-inch set on the bench. It had a vertical chassis, full of printed-circuit boards. I knew what was wrong with the set, but I kept that to myself.

"Pete," I said, "electronics is an art. For instance, you should try to make



he said, holding up an X-ray picture.

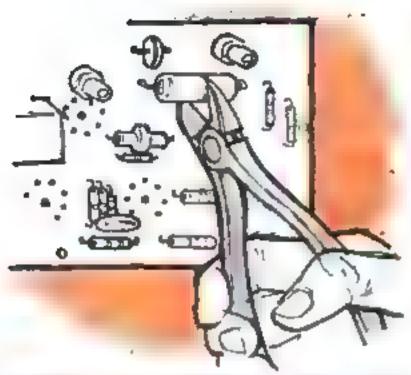
every solder joint a pleasure to look at." "Yeah, I know," he said, switching on the set. The screen lit up but there was no sound or picture. As I watched, Pete attached a needle probe to a voltmeter. Puncturing the circuit-board varnish with the needle, he began to take some voltage readings.

As his probe touched the cathode of the audio-output tube, he took a closer look. It read only plus 10; the schematic called for plus 130. Then he pulled the tube and took another reading. It was

still plus 10, indicating that the voltage loss had nothing to do with the tube current flow

Pete turned the set off, "Might be one of two things," he said. "Could be a resistor between the B-plus voltage source and the cathode has increased in value. That would cause excessive voltage drop, robbing the cathode."

He paused, I nodded, and said, "Or?" "Or," he went on, "there is a short in the cathode circuit, shunting off the voltage elsewhere. Let me check."



1 CHOPPED THE CONDENSER IN HALF with the dikes. Then I cleaned off the ends until I had two leads standing out from the board.

Pete read the resistors. They were right. Then he took a resistance reading, cathode to ground. Instead of 10,000 ohms, the meter showed 500. He examined the schematic. There was one .047 MF condenser between the cathode and ground.

"That's the culprit," he said, grabbing a pair of dikes (diagonal cutters). As he

started to work, I coughed.

Looking up at me, he sighed, put down the dikes and picked up a long-nose pliers and soldering iron. My "sloppy-work" admonitions hadn't all been wasted. I saw he was about to detach the condenser and try to reproduce the beautiful factory wiring."

"Hold it!" I said. "That's the wrong

way."

Pete dropped his tools, his face flushed. "Okay, Art," he said. "You do it your

way."

I grinned, because I knew he would blow his top when he saw "my way." As I picked up the dikes and chopped the condenser in half, his jaw dropped. Then I cleaned off the condenser ends till I had two leads standing out from the board, and attached a replacement .047 to the old condenser leads. A bead of solder on each connection point finished the job. I stepped back and waited for the blowup.

It came. "You and your 'be-neat-Pete' preaching. Why, that's about the slop-

piest-looking job I've ever seen,"

"Granted, my boy. But every rule is made to be broken. On printed-circuits it's neat to be sloppy. You've just seen the correct way to install condensers and resistors in them. You should do as little as possible to a printed-circuit board"

"That was a dirty trick, Art," Pete said. "I was going to do it exactly that way until you stopped me. And I admit it would have been an even sloppier job."

"I know, Pete," I said, "I guess you're a natural for these printed-circuit repairs."

He still doesn't know whether to take that as a compliment or an insult.

# A Fix That Hit the Jackpot

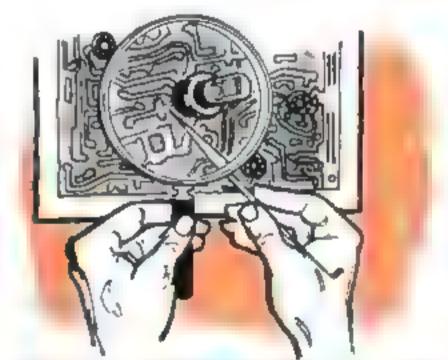
WHEN Aloysius O'Shea, our police chief, started his campaign against slot machines, I didn't see how it could affect a law-abiding TV serviceman. Then his teen-age daughter called me up

"Please fix my TV," she pleaded, "before Daddy finds out it's a slot machine."

I puzzled over that one as I drove over. Kate met me at the door, pony tail swaying, and led me to a new portable TV with sound and picture coming in fine. I asked her what the trouble was.

She glared at me as if she knew I wouldn't believe her. "The sound goes off in the middle of my rock-and-roll program, darn it. Then I drop a quarter in this slot and it works again."

I examined a slot at the top rear of the



1 HELD UP MY MAGNIFYING GLASS and examined the solder joints leading to the tube's screen... and there was the trouble.

set—a ventilation hole. Sure enough, there was a coin lodged about an inch down. Then the audio suddenly quit.

Kate put in another quarter, There was

[Continued on page 194]



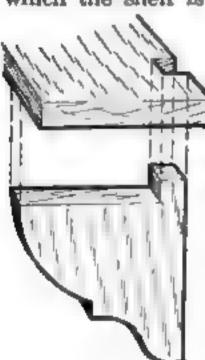
# Replacing a Board in a Floor

It's easy to replace a board in a hardwood floor with a nail-cutting blade in your electric handsaw. A cut through the two edges will remove the tongues so you can lift the damaged board out. Adjust the blade for a cut just deep enough to go through the finished floor.

In replacing the board, trim the tongue from the new board. Carefully clean out the gap above the subflooring, measure the replacement to fit, and put in place with mastic or countersunk and puttied finishing nails. Sand, shellac and finish to match.—E. D. Craig, Dallas, Tex.

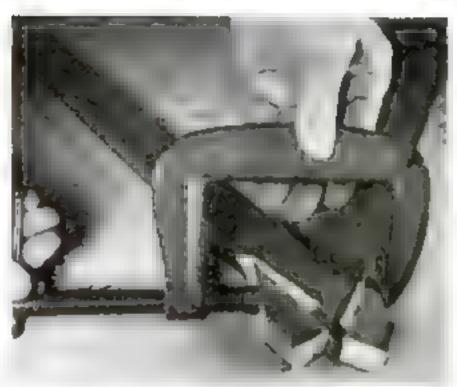
# **Jigsawed Shelf Brackets**

You can make brackets for a shelf from the leftover ends of the same lumber from which the shelf is cut. Jigsaw them to



the shape shown, cutting a tenon on the upper ends. Then notch open mortises in the shelf so its back will fit flush against the wall. Screw the brackets to the wall through the tenon and the narrow part of the bottom section, then screw the shelf in place.—Daniel Bousha, Jackson, Mich.





#### Miter Faces for C Clamp

If you cut blocks of the same angle as the miter joint you are gluing up, you will give your C clamp something to bite on. Put strips of plastic foam between the blocks and the sides of the joint to keep the clamp from slipping. Scraps of foam can be obtained from a dealer or upholsterer.—Paul Corey, Sonoma, Cal.

WHEN you paint exterior wood above masonry, get a nonchalking paint from your dealer. Unlike regular house paint, it won't wash down and stain the masonry.—Juel L. Melstad, Hetland, S. D.

# Answer to the Coarse-Threaded Vernier Problem

[on page 163]

JOE simply threaded half the control shaft for \(^3\gamma''\)-16 threads from one end and the other half for \(^3\gamma''\)-24 threads from the opposite end. Though turning the shaft moved both anvils in the same direction, the one mounted on the 16-thread nut would outrun the other by the difference in the thread pitches, or 1/48", on each single turn of the shaft. Each of 20 divisions on the rim of the control knob would indicate a movement of 1/960" between the two anvils.

# Traffic Test for Seagoing Drivers

Here are the eight most common traffic situations afloat. How would you handle them?

OTORBOATS 16 feet long or over must carry a horn or whistle to use in situations like those shown below. Smaller boats are not required to signal.

Afloat, a horn is not blown just to attract attention. When it's blown and how many times are important to avoid confusion that could lead to a collision.

These are the sound signals you should know to operate a boat safely:

One short blast—I will pass you by keeping to my right.

Two short blasts—I will pass you by keeping to my left.

Four or more short, rapid blasts-I



IN A NARROW CHANNEL, you see a hoat beaded your way. Which side of the channel do you keep to while passing the other boat?



2 DEAD AHEAD is a boat coming from the opposite direction. Unless one or both of you changes course, there will be a collision.



5 a collision course with your boat. What action, if any, should you take?

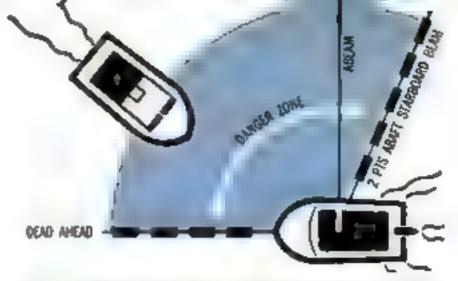




6 A SMALL SAILBOAT is headed across your bow from the left side You are moving slightly faster in your runabout.

do not understand your signal, or what you propose to do is dangerous—don't do it. This is called the Danger Signal.

The one and two short-blast signals are used when boats meet, approach or overtake. When meeting or approaching, either boat signals and the other answers with the same number of blasts to show understanding. But if the first boat's maneuver appears dangerous, the second blows the Danger Signal. Both slow down or stop until agreed. An overtaking boat blows once or twice to indicate the aide it wishes to pass on. If safe, the overtaken boat repeats the blasts; if not, it blows the Danger Signal.



THIS DIAGRAM SUMMARIZES most of nautical driving rules. A boat approaching you from any point within the danger zone has right of way.

Please turn page for answers to water-traffic situations





3 APPROACHING ON A REVERSE COURSE, other boat is far enough to your right to pass clear if neither boat changes direction.



4 CROSSING FROM THE LEFT is a cruiser on a collision course with your boat. One or both boats must change course or speed.



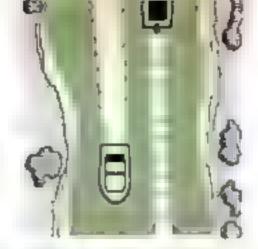
7 YOU ARE OVERTAKING a slower boat. The water is deep enough for you to pass on either side. No other boats are nearby.



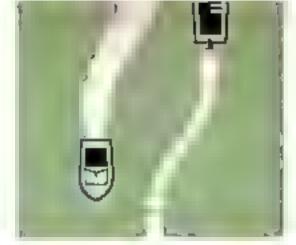
O YOU ARE BEING OVERTAKEN by a faster boat O There is open water on both sides and no other traffic is coming toward you.

# Answers to Nautical Rules of the Road Quiz on Previous Pages

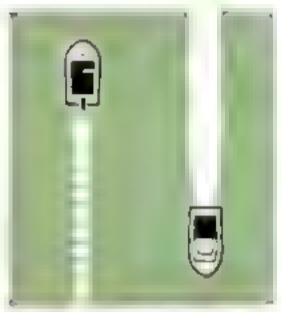
Source Pilot Rules for Certain Inland Waters, U.S. Coast Guard publication GG-169.



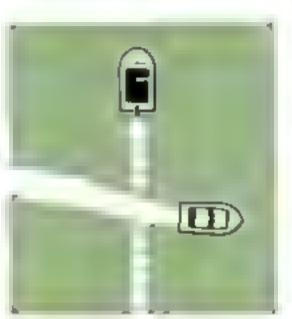
REEP to THE RIGHT in a parrow channel—as on the highway. This rule is not absolute on the water, however. If it is easier or safer to keep to left of midchannel, you may do so.



2 turn to your right, altering course enough for the other boat to pass safely on your left. He must do the same. There is no choice in this situation; you must move to the right.



3 stay to your LEFT until the other boat has passed safely. If your course is only slightly to the left of the other boat, turn to your right as in the dead-ahead situation.



4 HOLD COURSE AND SPEED

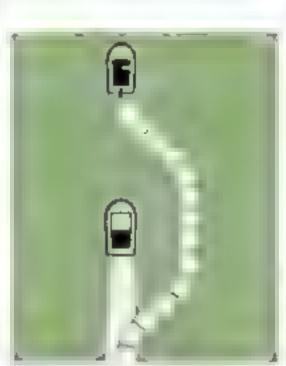
-vou have the right of way. He should slow down or change course to pass astern of you. You must keep same course and speed to avoid confusion.



5 turn to your right and pass astern of the other boat. Any boat approaching you from dead shead to two points abaft the beam on your right side has right of way.



6 TURN LEFT and go astern of him. Any sailboat has the right of way over a power boat, regardless of which side it approaches, because a sailboat is more difficult to maneuver.



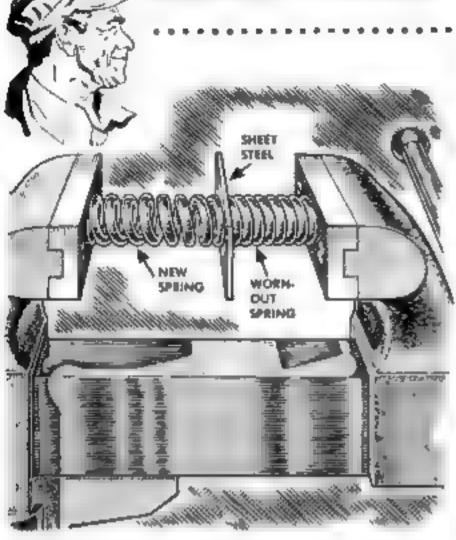
7 PULL OUT AND PASS on whichever side seems better. Give the other boat a wide berth while passing. Don't cut back on course until you are well up ahead of him, out of the way.



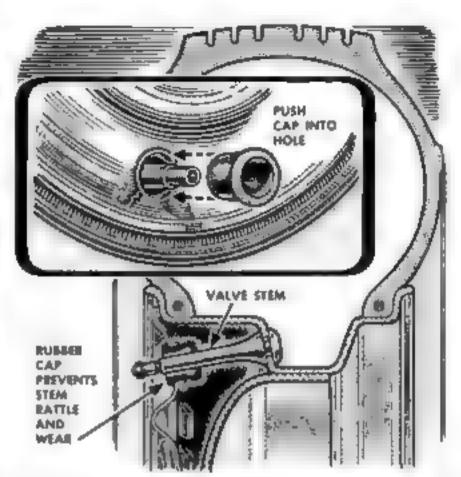
O let the other boat pass you on either side. The Rules of the Road require you to avoid crowding on the course of an overtaking boat as it attempts to pass.

178 POPULAR SCIENCE AUGUST 1959

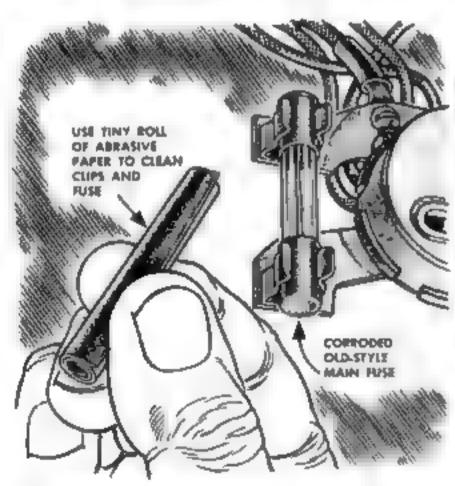
# Hints from the Model Garage



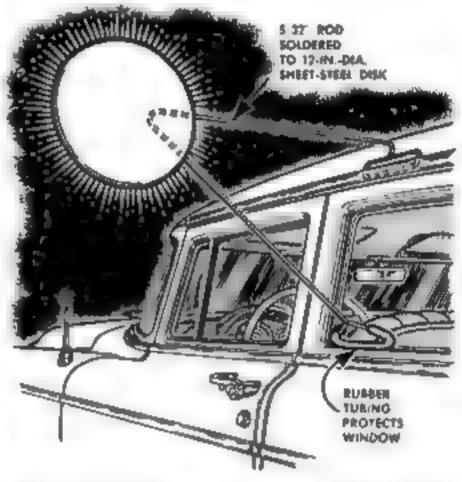
Spring check-up. To find whether a valve spring is too weak for further use, compare it with a new spring like this. Close the vise jaws just enough to support the two springs, then measure the length of each—the new one and the old one.



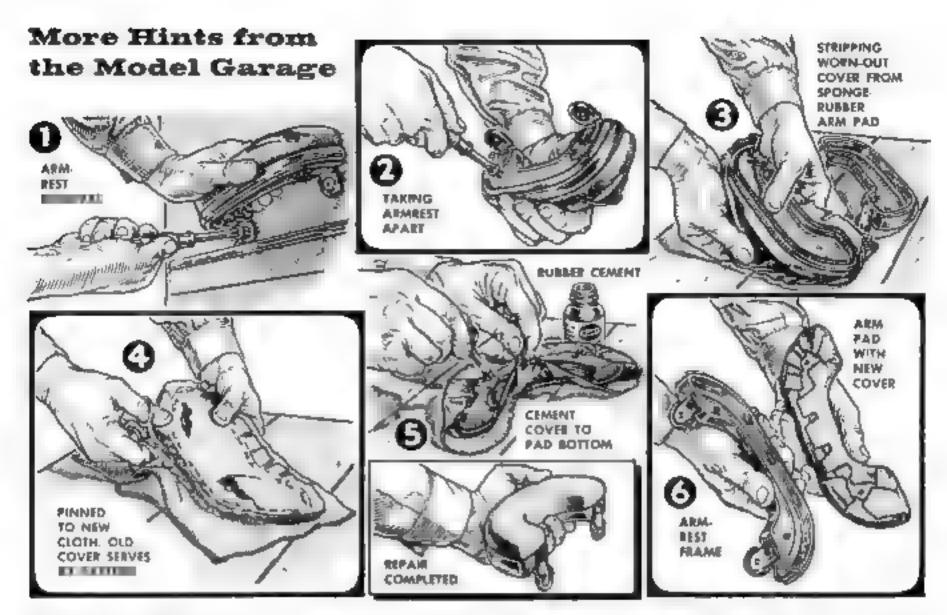
Valve-stem guard. Valve stems may rattle against the edges of the hole in a wheel cover. Also, the cover itself may shift, cutting the stem. To avoid both annoyances, slip a distributor-terminal nipple over the valve stem.



Light brightener. On an older car where the main fuse has been in place for years, corrosion may be reducing output from the head lamps. Cleaning the clip and fuse with abrasive paper will often make the lights much brighter.

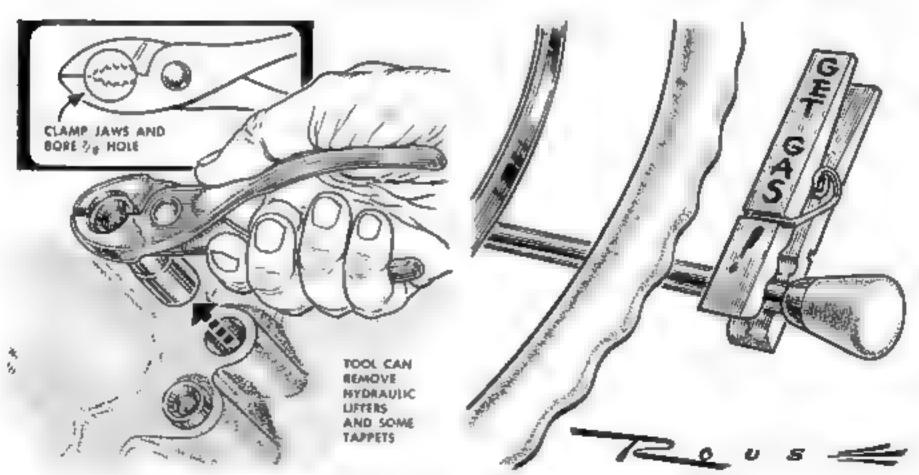


Emergency signal. For night breakdowns along the highway one motorist carries this warning signal in his trunk. The disk can be coated with reflective paint or covered with reflective tape. A pie plate could be used as the disk.



Armrest repair. As a car grows older it's natural that the armrest on the driver's door should wear through on the top. When this happens, a new cover can be put on easily, using material that either matches or contrasts with the original up-

holstery. The normal sequence of operations is shown here. After applying cement as in Figure 5, shape the material to the pad, carefully smoothing it on the upper surface. Reassemble the armrest and the cover will remain taut.

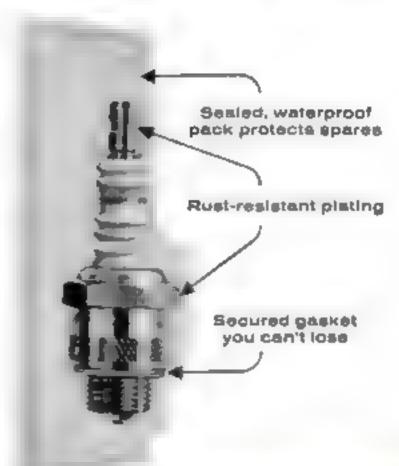


Lifter remover. One mechanic has converted an old pair of pliers into a tool for removing hydraulic lifters. The tool can also be used to remove tappets in those cars where it isn't necessary to approach them from below.

Get-gas reminder. When gas is low, remind yourself and other drivers in the family to refuel next time the car is out. Snap a market clothespin on the shift lever or steering wheel. Keep it on the sun visor when it's not in use

# Here's why <u>you</u>r choice for boating should be this <u>plated</u> Champion marine spark plug!

It's the only plug with all these features. When you carry these Champions, your spares are always in perfect condition—and easy to install even out on choppy water...





WATERPROOF PACK

Only plated Champions have a completaly waterproof pack. After 24 hours under water, these two plated Champions went directly into an outboard ... started it on first try!





RUST-RESISTANT PLATING

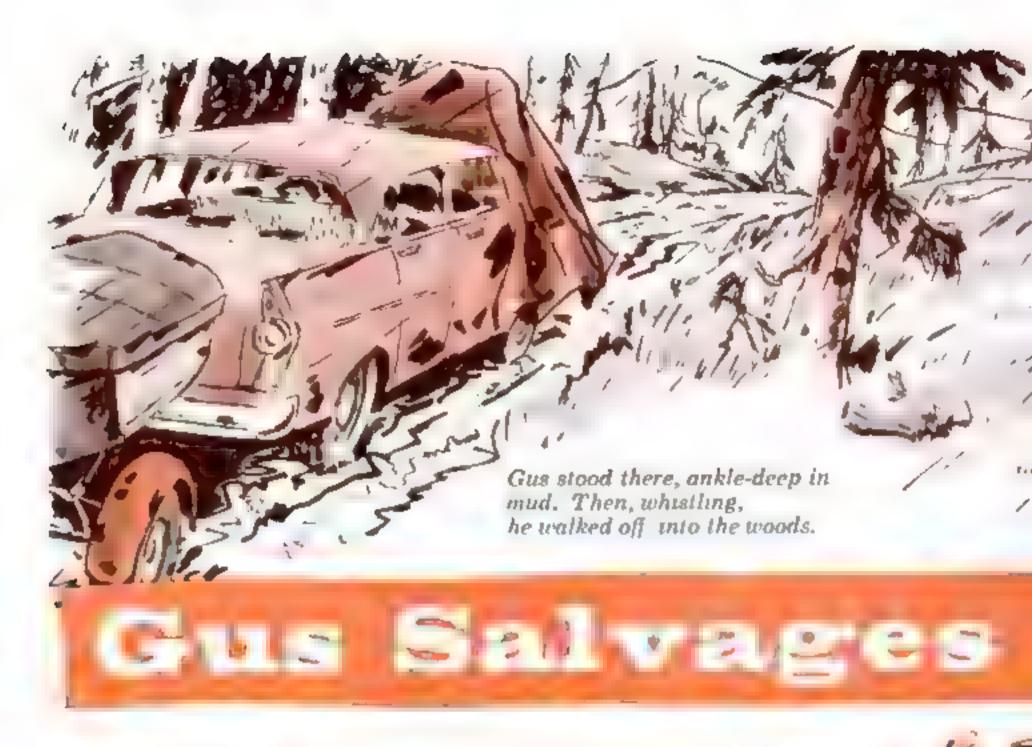
Special planing makes Champion marine spark plugs highly rust-resistant. These plugs were all soaked in fresh and soll water, then sprayed. Shiny one at right is plated Champion.



ATTACHED GASKET

This photo shows how Champion's attached gasket that con't fall aff makes Installation easier. You can actually install the plated Champion with one hand tied behind you!

YOU'RE A SAFER SKIPPER WITH A SPARE SET OF CHAMPION SPARK PLUGS



# By Martin Bunn

US WILSON, snuggled between sleeping bags in the back seat, was dreaming of fish—big, beautiful fish that leaped to take his bait.

A clap of thunder woke him. He yawned, and stretched luxuriously. In the front seat his buddies, Pete Vancourt, who was driving, and Elmer Stoddard, were reminiscing about previous fishing trips the trio had made to Wilderness Lake.

Gus thanked his lucky stars he had an able assistant in Stan Hicks to take care of the Model Garage at vacation time. He looked back and happily eyed the boat-loaded trailer bumping behind on the mountain road.

Stoddard turned around. "Sounds as though we might run into some bad weather, Gua."

"Make the fish bite better. Relax, Elmer-think of it,

nothing to do for a week but fish and loaf."

"Then think again, Gus Wilson," Vancourt put in. "Since I'm furnishing the car, you'll do the chores. We'll have you so busy chopping wood, cooking, and washing dishes, you'll wish you were back in the Model Garage grinding valves."

"And since I'm supplying the boat," Stoddard added, "I'm counting on you to clean all the fish we catch."

"Naturally," Gus agreed, "since I'm the only one who

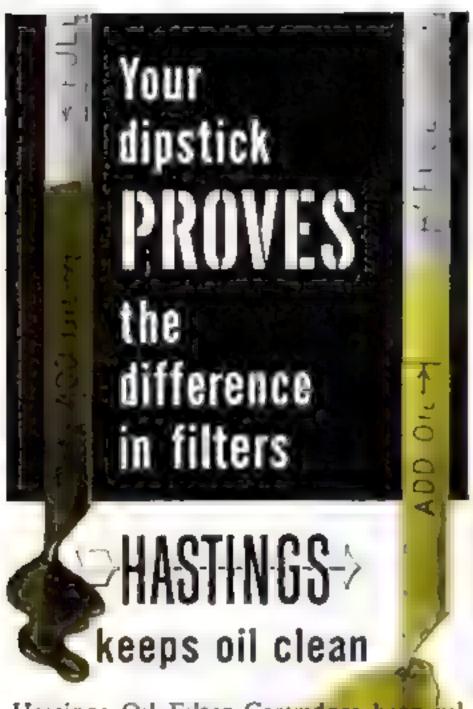
can catch any."

"Whoa, there, Gus!" Stoddard protested. "Who caught the heavyweight last year?"









Hastings Oil Filter Cararidges keep uil clean from filter change to filter change when replaced as normally recommended.

That's because only Hasting has Densite filtering material, which traps and holds even the most microscopic dirt particles. The dipstick test proves it!

Just ask for Hastings—next filter change.

Be sure of clean oil all the time.

Proved by tests conducted in accordance with U.S. Bureau of Standards.

ta 5 Paten Numbers 2 797 9: 1 2 564 775



HASTINGS MANUFACTURING COMPANY

Casite, Piston Rings, Oil Filters, Spark Plugs

"Sure, after you shoved a pound of sinkers down its craw. Why, my big walleye topped your skinny pike by a good pound."

They had been climbing steadily, and as the car topped the mountain summit, a bank of black clouds, shot with lightning, moved swiftly in from the northwest. Thunder rumbled along the forested ridges as the first drops of rain fell. Then came the downpour. The winding dirt road turned to mud.

SUDDENLY the engine began to miss. Gus spoke up fast, "Keep pushing her," he warned, "We don't want a breakdown in this deluge."

"Listen to the back-seat driver," Pete

said, down-shifting to second,

"I'm listening to that engine," Gus said. The missing became worse, developed into a series of backfires. Then the car shuddered to a stop.

The three men looked at each other, silently listening to the rain beating on the car roof, the mean of wind through the swaying trees. "You," said Vancourt pointing at Gus, "are the mechanic."

"Not me. My job is cleaning fish. Re-

member'''

"Gus has a point there," Stoddard said. "Hop out and get us rolling, Pete."

Vancourt pulled out a cigarette and lit it. "If you characters are counting on me, the fish in Wilderness Lake will live to a ripe old age. I know even less about engines than Elmer here."

"Yeah, I forgot about that," Stoddard said. "It's up to you, Gus, Get out your

tools and make like a mechanic."

"What tools?" Gus asked. "When I'm invited on a vacation by so-called friends, I expect them to furnish a car, not a backfiring teakettle. I'm sleepy." He yawned, settled back among the sleeping bags and closed his eyes.

"Aw, come off it," Vancourt said, grabbing Gus's arm and shaking him. "We've still got 50 miles to go."

Gus sat up and peered out into the downpour. "I might get struck by lightning out there." He grinned. "Oh, all right, but it's just because I can't wait to get at those fish."

"That's our boy," Stoddard encouraged as Gus struggled into boots and a slicker. Pulling a floppy rain hat down

around his ears, he climbed out and dug a tool kit out of the trunk. Opening it he saw a pair of pliers, a screwdriver and a monkey wrench.

"With this I'm expected to put in new timing gears?" he asked Vancourt.

"Timing gears?"

"Sure," Gus said. "What did you think was causing all that backfiring?"

"He's kidding, Pete," Stoddard said.
"Okay," Gus admitted. "But you guys
better get busy putting a canvas tarp
over the hood or we'll drown out the
engine for sure."

WORKING together, Vancourt and Stoddard draped a canvas over the raised hood. As each held up a corner, Gus ducked underneath and went to work.

Then he started looking for some trouble that could have been caused by water thrown up over the engine by the front wheels. The backfiring in the muffler indicated that raw gas was being shunted there, and that the cylinders were firing out of time.

"Hand me a flashlight, Elmer." Stoddard dropped his tarp corner and dug

into the glove compartment.

With a better light, Gus noticed that the secondary wires to the spark plugs were held together by a fiber fixture attached to the block. The fixture was wet. Suspecting a spark leak, he removed the wires and wiped them dry with a bandanna. Next he checked ignition connections, removed the spark-plug wires from the distributor cap, and dried out the contacts by twisting the corners of his bandanna inside.

"Try her now, Pete," he shouted

When the engine caught, it backfired like a machine gun and ran so rough it threatened to shake loose from the hangers. Gus was puzzled. He hadn't really expected to find anything seriously wrong. Now he wasn't so sure.

"Okay, that's enough, Pete," he yelled, ducking back under the canvas. It had to be ignition trouble, but locating it under these conditions was something

else.

He pulled the distributor cap, bridged the starter relay terminals with the handles of the pliers, and rocked the ignition points open on a cam lobe. The points seemed to have about the right

# USING TOO MUCH OIL AND GAS?



# IT'S TIME FOR HASTINGS

When your oil and gas bills start growing bigger —look out! Using too much oil is your first sign of worn-out piston rings. And worn-out rings mean power drop-off—costly waste of oil and gas—and expensive repairs later on!

The sooner you act, the less it will cost. When your motor specialist recommends new piston rings ask him for Hastings. They're engineered exclusively for replacement service... to provide the additional lubrication worn engines need... to stop oil-pumping, save gasoline, restore lost performance.

Get new car power and performance from your present car—with Hastings. Truly your best investment for many thousands of extra miles of trouble-free driving pleasure.



# PISTON RINGS

TOUGH on oil pumping GENTLE on cylinder walls

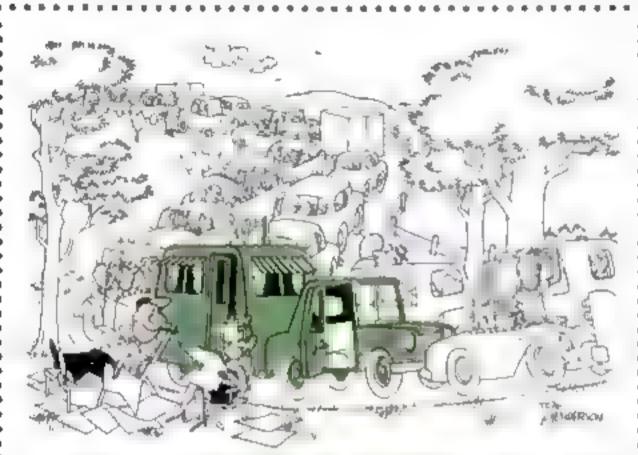
MARNING MCHIGAN

Piston Rings, Casite, Oil Filters, Spark Plugs

gap, with no signs of pitting or burning. He turned the distributor cap over and

played his flashlight inside.

There was the trouble—a jagged crack running from the center, high-tension rotor contact segment to one of the sparkplug wire terminals at the distributorcap edge. High-tension spark impulses were being diverted along this shorting crack. Meanwhile spark impulses intended for other cylinders were so weakened that missing occurred.



"I can't remember when I've enjoyed a Sunday drive so much."

TUS came out from under the canvas J shelter. "We're in a jam, boys," he announced, "Let's get in out of the rain."

When the dripping trio was seated in the car, he explained the situation.

"Now isn't that just dandy," Vancourt said. "Elmer and I bring along a bull-necked, impossible-to-get-along-with mechanic on our vacation simply because he is supposed to be able to fix things. Then, the first thing goes wrong, he gives with explanations."

"Leaving us," Stoddard added, "stuck in the mud 50 miles from nowhere. Well, we might as well break out the tent and get settled here for the night."

"Suits me," Gus agreed.

"Elmer and Fll take care of the tent," Vancourt said. "You scrounge around for some wood, Gus. Maybe we can have a fire if the rain lets up a little."

Gus stood ankle-deep in mud, gazing off into the forest. "Aren't those spruces growing on a little rise over there?"

"What's the difference?" Stoddard asked. "We're not going to chop down any trees. A few loads of fallen deadwood is all we want."

Gus was whistling as he walked into the woods. In a few minutes he was back, and stuck his head and shoulders under the open-hood shelter. His companions, wrestling with the tent, watched as he emerged, removed the canvas, shut the hood and got into the car. When he

> stepped on the starter, the engine sprang to life, running

smoothly.

"Well, what are we waiting for?" he called out. "Hop in and let's go fishing."

Stoddard and Vancourt lost no time in getting into the car.

"And let it be understood," Gus said, "that I'm driving the car for the rest of our vacation. You, Pete, have the fish-cleaning chore."

"For getting us out of that mess. we'd serve you break-

fast in bed."

"Don't overdo it,"

Stoddard said, "But just how did you fix that crack in the distributor cap, Gus?"

"Nothing to it," Gus explained modestly. "I collected some gum oozing out of a big spruce, smeared it into the crack, and stuck a bit of paper on top."

"What kind of a fix is that?"

"It stopped the short," Gus said.
"But Elmer's right," Vancourt said. "We've got 50 miles to go and then 100 back home. We'll never make it."

"Maybe you can make a more permanent repair up at the lake," said Elmer.

"Nope," Gus said, "But I wouldn't be surprised if that spruce-gum job held up for a thousand miles."

"Have it your way," Stoddard said, "but for gosh sake take it easy so we don't jog that crack open again."

In reply Gus stepped on the gas. "Relax, you two. We'll make it all right."

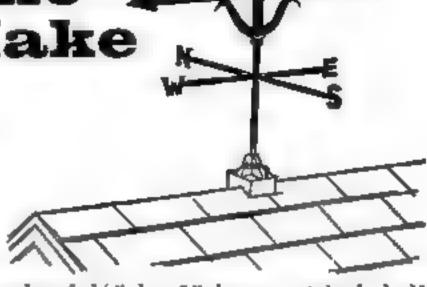
They did,

Next Month: Gus estimates a wreck.

Weldless Weather Vane Is Easy to Make

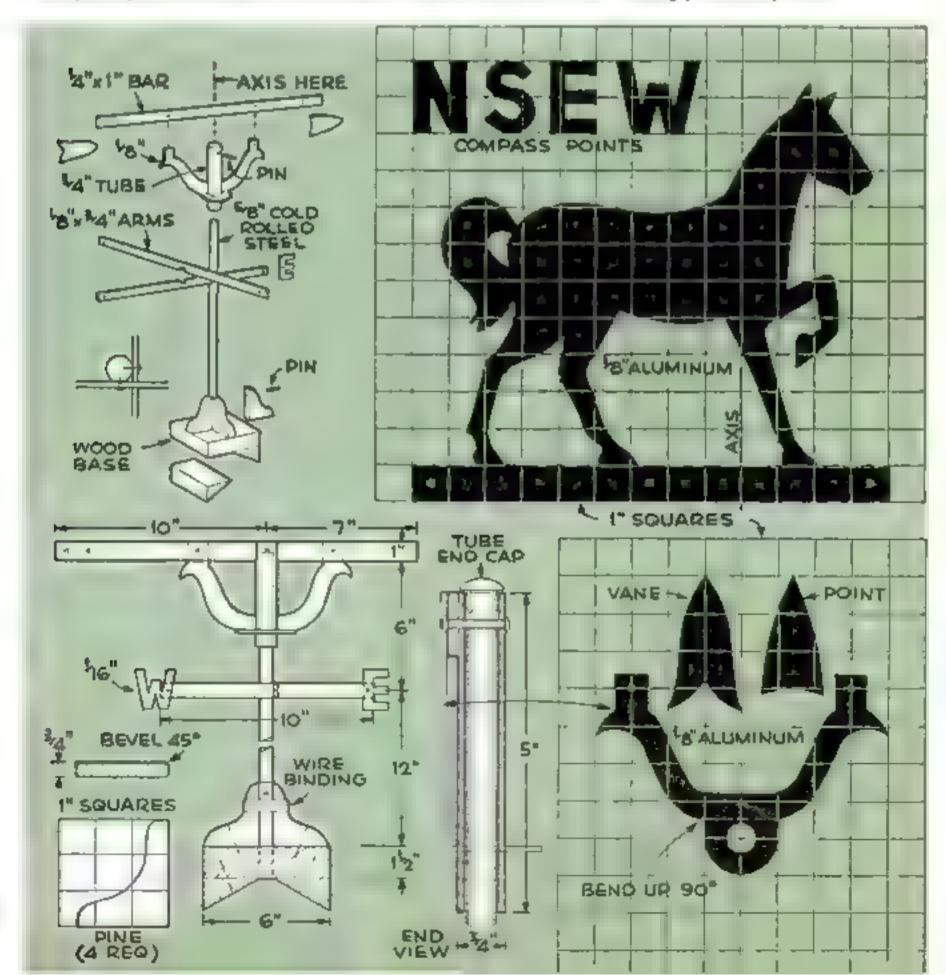
THE appearance of an expensive wrought-iron weather vane can be obtained without welding by using easily worked aluminum and painting it black.

This popular horse silhouette was cut from \( \frac{1}{8} \)" aluminum, using a coping saw fitted with a metal-cutting blade. It is supported by an aluminum bar having a sheet-aluminum arrow tail and point riveted to its ends. The main support and pivot base also was cut from sheet metal. The silhouette swings on a tube loosely fitted over a well-greased steel pole, the top of the pole bearing against a pin that joins the arrow to the tube. Compass-point letters are riveted to the



ends of 1/4" by 1" bars, notched, halflapped and bolted to the pole.

A wood base straddles the roof peak. A tight binding of soft copper wire clamps the four base sections firmly around the steel pole. Twist the wire ends tightly with pliers and cut them off close to the wood.—Hi Stbley, Nuevo, Cal.



# NEW Kodak Retina Reflex S



You can shoot this close with supplementary "R" lenses-no parallax error with any lens'



You focus needle-sharp on time-grained full-area ground glass -- or by splitimage rangefinder.



You freeze action with 1 500, fully automatic shutter Speeds from 1 sec. B, flash synch.



Line up a meter pointer—and your lens is set for correct exposure! For films 5 to 1300 ASA.



You command small subjects with close-up lenses —enjoy a full range of precision filters.



You wind him with a flick of the thumb...set the self-timer to get in the picture yourself.



You capture ultra-small subjects with this microscope attachment—one of many Retina photo aids.



You switch easily to wideangle or telephoto lens. Smooth, quick bayonet couplings.



You shoot from low level, get novel angles, with right-angle finder—another Retina special aid.

# EASTMAN KODAK COMPANY

# Camera makes you master of every picture situation!



Master of every situation? Yes. This new precision 35mm pentaprism reflex is the camera with the answers to all a hobbyist's picture needs.

Name your interests—astronomy to zoology . . . sports action to spelunking . . . car-racing to gem-cutting . . . power-boating or model-making or what you will. Pose any challenge to the Retina Reflex S and its system of aids. Then watch it respond like the thoroughbred it is!

For twenty-five years, the words "I own a Kodak Retina" have been proud words in any tongue. Every man deserves to own one supremely fine camera in his lifetime—and this new Reflex S is the finest Retina of them all.

Correct exposure? Match a pointer to the meter needle—and your lens is set at the right opening.

Precise focus? You focus and frame a big-as-life image on full-area ground glass—needle-sharp, right side up, with no framing error ever.

Field depth? Automatic pointers move as you focus—tell you the exact depth of field at all times.

Dim light# Automatic diaphragm lets you focus at wide-open brilliance with any lens.

Scene control? A superb family of wide-angle and telephoto lenses—for broad views in cramped areas, or to pull in distant scenes.

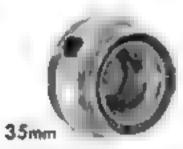
Speed# Fast-action shutter, rapid thumb-flick film advance . . . and a choice of razor-sharp 50mm f/2.8 and f/1.9 basic lenses.

Specialized aids? A complete system
 to keep pace as your interests grow.

Let your dealer tell you the full story of this great camera. The Kodak Retina Reflex S with 50mm f/2.8 lens is \$199.50. With f/1.9, \$235. And worth every cent.



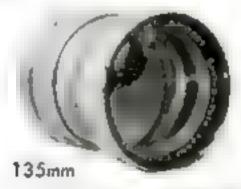
For cramped quarters choose that 28mm extreme wide-angle lens for your Retina S.



For medium wide-angle, this 35mm. All lenses also fit budget-priced Retina IIIS Camera (below).



For pleasing half-figure portraits, medium telephoto work, interchange to this 85 mm tele lens.



To reach out and pull in distant scenes, pick the 135mm. Lenses pictured, \$74.50 to \$87.50.



Rochester 4, N. Y.

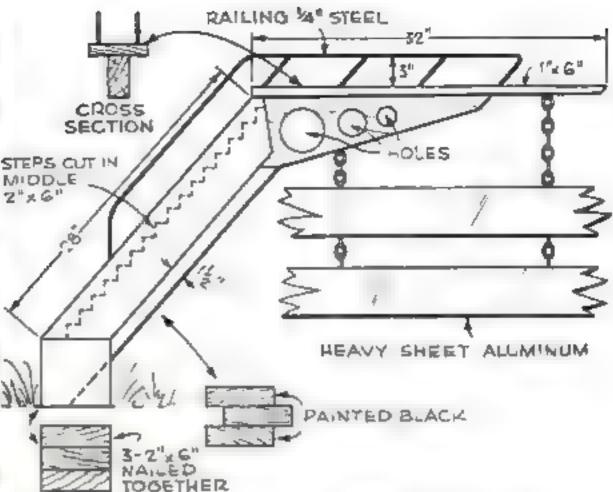
Reting HIS Comero: Handsome, budget-priced companion to the Retina Reflex S is the new Retina 111S—with multi-frame finder, built-in meter, automatic exposure linkage, lens interchange, rangefinder direct-coupled for all lenses. With 50mm f/2.8 lens \$157.50. With f/1 9 \$193. Most dealers offer terms as low as 10% down. Prices are list, include Federal Tax, are subject to change without notice.

See Kodak's "The Ed Sullivan Show" and "The Adventures of Ozzie and Harriet."



#### House Marker in Florida Style



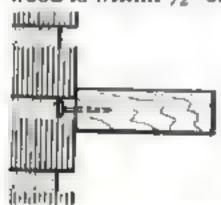


A MINIATURE diving board I put up for our name and address brings us compliments. It's built of two-by-sixes, as in the drawing. Forward edges of the stairway and inner edges of holes are painted black, everything else white. A plastic-doll bathing beauty waves to passersby.

—F. C. Rush, Eglin AFB, Fla.

#### **Nail Rake for Mortar Joint**

When I built a fireplace in my den, I hit on an idea for raking mortar joints. I drove a six-penny nail into a block of wood to within \(\frac{1}{2}\)" of the head. Then, with



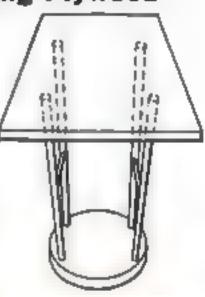
the block resting on the bricks, I raked the nail through the partly dry mortar. It made a joint that is uniformly square.—

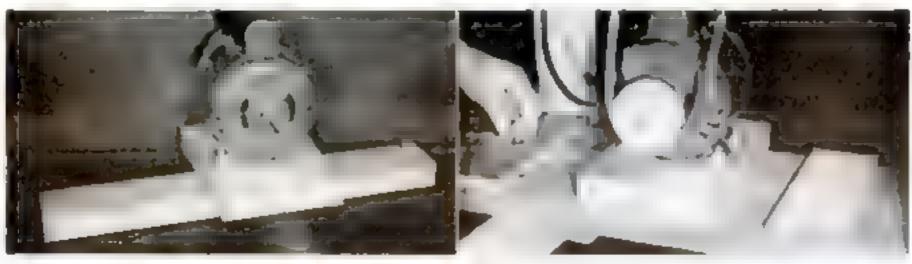
James D. Chapman, Memphis, Tenn.

#### Support for Sawing Plywood

You can do much of the cutting on plywood with a portable jigsaw if you support the sheet on the feet of an inverted shop stool. With a little care, you can manipulate the saw so it won't cut the legs.

—G. E. Hendrickson, Argyle, Wis.





# Tension-Adjustable Motor Mount for Small Jointer

Dressed two-by-fours joined by ½" plywood plates form this stable motor base for a small jointer. With a wing nut and bolt in the slotted plate, you can adjust motor position for any required tension on the belt. The base is built in two

parts, one sliding on the other. The motor is bolted to two blocks attached to a sliding member. Guide bars are held in place by the plywood pieces. A bolt in the slide bar projects through the slot.

—C. A. Fenner, West Vancouver, Canada.

# How to pass a genius



All of us can't be geniuses. But any ordinarily talented mortal can be a success—and that's more than some genuses are.

Now, as in Æsop's time, the race doesn't always go to the one who potentially is the swiftest. The trained man has no trouble in passing the genius who ham't improved his talents.

In good times and bad times, in every technical and business field. the trained man is worth a dozen untrained ones, no matter how gufted.

The International Correspondence Schools can't make you into a genius. For more than 60 years, however, I. C. S. has been helping its students to become trained, auccessful leadersand it can do the same for you.

Mark your special interest on the coupon. Don't be like the unsuccessful genius who wastes his life in dreaming of what he intends to do. Act now!

For Real Job Security - Get an I. C. S. Diploma! 1. C. S., Scranton 15, Penna. National Stone Study County

Accredited Member.

#### INTERNATIONAL CORRESPONDENCE SCHOOLS BOX 59641H, SCRANTON 1E, PENNA. (Partial Not of 200 courses) Without past of obligation, send me "HOW to SUCCEED" and the apperhenity backlet about the field DEFORE which I have marked If (plus semate lesson): AACHITECTURE AVIATION CIVIL Good English High School Methomatics (ndustrial Electronics Practical Radio TV Engir's Practical Telephony ENGINEERING Aero-Engineering Technology Short Story Writing CONSTRUCTION Accept & Engine Machinic Crest Engineering Air Conditioning Radio-TV Servicing Construction Engineering BUSINESS LEADERSHIP Architecture Highway Engineering 🖳 industrial Foremanship Accounting Professional Engineer (Ciril) Reading Struc Bisepriets Arch Drawing and RAILROAD Advertising adustrial Supervision Designing Building Contractor Car Inspector and Air Brake Business Administration Personnel-Labor Relations Structural Engineering Dieset Ciectrician Susmass Management C. Zapervition Diesel Engr. and Firemen Buriding Externator Serveying and Mapping Coal Accounting Carpentry and M Ilwork MECHANICAL Crestore Setermanship □ Dissail Lacorpolive Carpenter Foremen DRAFTING and SHOP Managing & Small Business Healing Diesel Engines Aircraft Drafting Trolestional Secretary STEAM and DIESEL POWER Interior Decoration Architectural Drafting Gas-Elec Wolding Public Accounting Painting Contractor **Drafting Machine Design** industrial Engineering Purchasing Area Combustion Engineering Plumbing ■ Electrical District adviseral Instrumentalies Power Plant Engineer Salasmanship C Salesmanship Salesmanship and Reading Arch Bissprints ■ Machanical Drafting Industrial Melallorgy Stationary Durse Engl. Street Metal Drafting netwetted Safety Stationary Faraman ART Management Structural Drafting Machine Design Commercial Act. C Traffic Maragement Machine Shop Practice Magazine & Book Him. ELECTRICAL TEXTILE CHEMICAL **Mechanical Engineering** Show Card and Analytical Chemistry Chemical Engineering Chem. Lab. Technicism Elements of Nuclear Energy Carding and Spinning **Electrical Engineering** Professional Engineer (Meth) Sigh Luttering Elec Engr Techniques Elec Light and Power Cotton Manufacture Quality Control Shatching and Pointing Cotton Warping and Waaving Read my Shop Bluesrints Lasm Fixing Technicum **JVITOMOTIVE** Refrigeration and Practical Coefficient Automobiles Textile Designing Gangrai Chemistry Air Conditioning Practical syneman ☐ Natural Gas Prod and Trans. ☐ Patroleom Prod and Engr Turitle Finishing & Dyning Auto Body Rebuilding Professional Engineer (Elec) Tool Design Tool Making and Refinishing Throwing Auto Engine Tonesp MADIO, TELEVISION General Electronics Tech. Warping and Wasving Worsted Manufacturing HIGH SCHOOL Prolessional Engineer Charm) Auto Technician High School Diploms Pulp and Paper Making Jihang Adding **Working Hoors** \_A.M to P.M. Canadian residents send coupon in International Correspondence Schools, Canadian Ltd., Occupation. Montreat, Canada. Special testion rates to members of the U.S. A well forces,



### Starting Car Without a Battery

My BATTERY died and the coil was weakened by inadvertently leaving the ignition on for two days while fishing. I hit on this idea to get it started again.

First, I removed the fan belt and loosened the adjustable slot on the generator, then circled the crankshaft pulley with a length of rope.

Next, with one man feeding the rope in while keep-

ing a steady strain, two of us gave a quick pull like starting an outboard motor. After a few pulls, the idea paid off.



Then we replaced the fan belt, being very careful because we had to leave the motor idling.—Bill McCarthy, Bathurst, Canada.

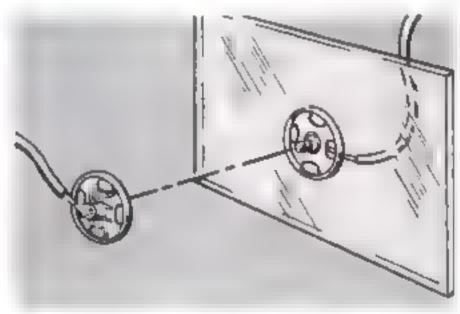


# **Towel Rack for Small Space**

Hanging room to dry towels for five people in a small trailer or summer cottage can present a problem. If you have wall space still not in use, you can install a rack built on an incline with dowels spaced so the towels will dry.

For added convenience, put in cup hooks for wash cloths, and add a raised edge to the top to provide a shelf for toilet articles. Size and slope will be determined by the space you have available.

—Walter J. Luxenburg, San Diego, Cal.



# Tiny Radio Plugs and Jacks

Instead of using bulky commercial plugs and jacks on my homemade transistor pocket radio, I made my own from

snap fasteners used on clothing.

I soldered a fine wire to the back center of the male half and drilled a 1/4" hole for the wire in the plastic case. It could be burned in with a wire wrapped around the tip of a soldering iron. Then I inserted the wire from the outside, pulled it in tight, and mounted the snap by pushing on it with the hot soldering iron, taking care not to let it get hot enough to unsolder the wire.

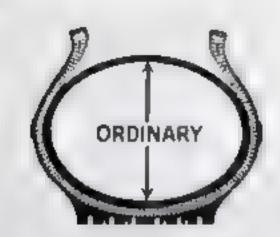
When I soldered a wire to the remaining snap, I had a good lead to headphones or an antenna.—Bob Culter, Oswego, Ore.

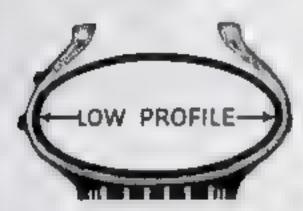
# A Radically New Way To Build Tires!

# LOW PROFILE



TIRES





New U. S. Royal Low Profile tires represent a radically new type of tire engineering... specifically designed to meet and exceed today's driving conditions. They are lower, wider. This unique safety-shape gives them a "cool-flexing" action. Keeps them 13° F. cooler than conventional tires. Gives them greater protection against blowouts, far greater tread mileage. Protect your family with this great new safety "first" from U. S. Royal. See your U. S. Royal Dealer.

- SAFER at top turnpike speeds no matter how long you drive!
- SAFER against tire heat that causes ordinary tires to blow out!
- SAFER control on turns and curves!
- PLUS GREATER ECONOMY-25% to 35% longer mileage!

Originally introduced in the U.S. Royal Master, world's finest premium tire...

NOW PRICED WITHIN REACH OF ALL IN THESE NEW U.S. ROYALS

- WHITEWALLS BLACKWALLS
- TUBED

• TUBELESS



# U.S.ROYAL TIRES



United States Rubber

Rockefeller Center, New York 20, N.Y. • In Canada: Dominion Rubber Company, Ltd., See things you never saw before. Visit U. S. Rubber's new Exhibit Hall, Rockefeller Center, H.Y.

#### The Awesome Miracle of Lightning

[Continued from page 60]

gas in a neon tube. The "leader" hangs hesitating a moment, thickening and brightening as the electrons in the cloud swarm into it. Then it reaches down again, perhaps as much as 300 feet. Lightning may make as many as 40 steps like that, coming down. That's what gives it the familiar zigzag shape.

The activity of the positive charge on the earth may have increased now to where "streamers"—the opposite of the leaders—can be noticed leaping up from the high points in the vicinity. Photographs have been made showing them snaking as high as 50 feet upward. The phenomenon is familiarly called St. Elmo's fire. Now, in time, a streamer meets a leader and—hallelujah!—a path between the earth and the cloud has been opened. The point to be struck has been determined.

The great sky-splitting spear of light that we see is actually hurtling up, not down. It starts at the point of first contact between negative and positive charges and rips up to the cloud along the gas path which has been formed by the descending leader. The fact that the spear of light seems to travel down is an optical illusion that occurs when speeds become too great for the eye to follow: We then see what we believe, not what happens.

There is often a great pulsing in the light, made by successive strokes along the same path. There may be as many as 40 pulses in a second, which is about how long the lightning's path stays open. The heat in the path rises so abruptly that the surrounding air breaks the sound barrier in moving away. The result is thunder.

The power of a lightning bolt is truly unearthly. Eighty thousand locomotives hooked in a row couldn't work up the wallop of a single one of them. And there's plenty more where it came from—an average of 44,000 lightning storms a day around the world, few generating less than dozens, many generating thousands of strokes.

It has been estimated that a single flash of lightning develops a million times the voltage used in ordinary housewiring. This whole vast amount is delivered in a blink—a whiplash that is frequently as much as three miles long. Air is an insulating material through which electricity cannot pass. Lightning's electricity splits open and springs through this miles' high mountain of insulation with a force of 500 million horsepower. Steinmetz calculated

Lightning usually "strikes" one of the higher points in any area—a tree, a house, a golfer on a fairway. Current flows through the object struck by the best conducting path that object offers. If your clothing is wet, the current will go through it. You may even survive such an experience, for moisture is a good conductor of electricity. But, when lightning strikes a tree, for example, whose bark is dry, it travels inside the bark, in the sap. The sap is superheated to steam instantaneously, and expands so abruptly that the tree explodes like a bomb.

It is lightning's tendency to seek out the best path offered that makes the lightning rod work as successfully as it does. When no path is offered, lightning builds one—brutally! From the top of a chimney in a country home near Pittsfield, Mass., one bolt crashed like a bomb through the wood wall to ground level. But there was no metal, no plumbing or wiring, and the ground itself at that point resisted the passage of electricity. Whereupon the lightning zipped open a trench 155 feet long, two to three feet wide, a foot or two deep, through the sod to the house of a neighbor who had put in modern improvements. punched a hole six inches wide through the concrete foundation to leap across the cellar and finally latch onto a well pipe! In a dry, rocky pasture in Utah, lightning, landing on soil that similarly resisted its passage, hunted so widely for a pathway that it electrocuted 504 sheep before finding it.

Far older than man are the horrors and terrors wrought by lightning, and they never change. The work of the devil, it was called, and a century ago the civilized world tolled bells or shot off cannon to frighten it away.

Now science has learned at last that there is good in this most awesome force. It is one of the great throes in the continuing miracle of creation and existence.



## How to get thousands of extra miles from tires

1 Check tire pressure every week . . . or have your Texaco Dealer do it according to his accurate chart that indicates manufacturer's recommendations. Just one pound of consistent under-inflation can cut tire mileage by 1000 miles or more.

2 Make sure all tires have valve caps. They're not ornaments, but protect tire valve against dirt, grit and water. If one is missing, have your Texaco Dealer replace.

3 Don't let your spare rot in the trunk. Use it. Have your Texaco Dealer cross-switch all tires every 5000 miles to equalize wear.

4 Keep front wheels aligned and balanced. You'll get smoother, safer riding and steering in addition to increased mileage. 5 Accelerate, brake, and take curves gently. Otherwise you're scraping away precious rubber in seconds instead of over the miles.

When you drive with a heavy load, add a pound or two of extra pressure to each tire. This will reduce sidewall flexing, cut wear, let tires run cooler . . . safely.

7 Take advantage of the full riding comfort of properly inflated tires. Every 1000 miles have your car chassis lubricated with superior Marfak at your Texaco Dealer. This will give you a smoother, quieter, cushiony ride. At the same time, Marfak protects deli-

cate chassis bearings against wear and corrosion. Seals out grit, road dirt and water.



# SPECIAL OFFER





How to Drive and Stay Alive [Continued from page 55]

# Look out for bumps on curves ahead

In a race, a sports car entering a curve at 120 m.p.h. can be thrown clear across the track (30 feet or more) by even a small hump. Likewise your car, at 40 to 60 m.p.h., can be thrown head on against another car on a humpy turn.

I noticed that Fitch always hauled his speed down sharply if a turn shead looked uneven. "I brake, and then tackle the turn," he said. "When you hit a hump at a curve, your wheels lose traction and there is nothing to keep your car from sliding a few feet along a tangent. This can mean a head-on crash."

# Beware of driving an overloaded car

"I get chills," Fitch said, "when I see young drivers pile friends into a car with worn shocks and weak springs. Anything can happen to an overloaded car even a brand-new one.

"Many drivers don't know it, but a car with only two passengers in the rear seat takes up more 'effective width'. That's because the rear end swings out first to one side and then the other. Sideswipes are more likely to happen.

"With three or more in the back seat, most cars change dangerously from understeering to oversteering. They won't corner as well. And they won't stop near-

ly as fast,"

On the Lime Rock sports-car course, of which Fitch is technical director, he made a series of emergency stops in my car, sliding the wheels. He rode alone. To spare the tires, the stops were made from only 35 m.p.h. Then he put five teenagers into the car. Stopping distances then increased by eight to 15 feet. At a stop sign this could put a family-filled car in the path of a truck doing 60.

# Take a low-hazard road when you can

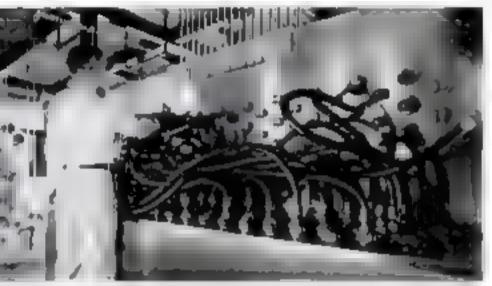
"On a trip today," Fitch said, "you are exposed to a certain number of dangers.

# IOW AMERICA'S NUMBER ONE CARBURETOR

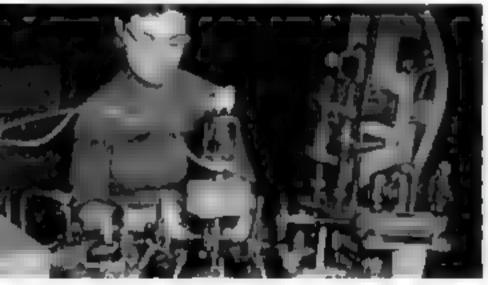
#### TESTS TROUBLE OUT, BUILDS RELIABILITY IN!



The GM Desert Froving Grounds simulate the most severe summer conditions. At the same time, other parts of the country are chosen to reproduce winter and extreme altitude conditions.



Rochester-GM Corburetors keep pace with the latest advances in fuel to give you years' ahead performance and economy an today's cars and an models of the future,



Quality is carefully controlled at every stage of manufacture to essure trouble-free performance of every Rachester GM Carburetor and assure that every gallon of gas does a lot more work,

Rochester-GM Carburetors must perform in all 50 states, twelve months of the year, regardless of weather conditions. To do this, trouble is tested out through millions of rugged test miles, simulating conditions in every part of the country. And, through research and careful quality controls, the makers of Rochester-GM Carburetors build rehability in! The results: the same dependable performance in June as in January. To keep this carburetor in top operating condition, it's important to see your factory-trained Rochester-GM Carburetor specialist for periodic maintenance. See him today, and see the difference. Rochester Products Division of General Motors, Rochester, New York.



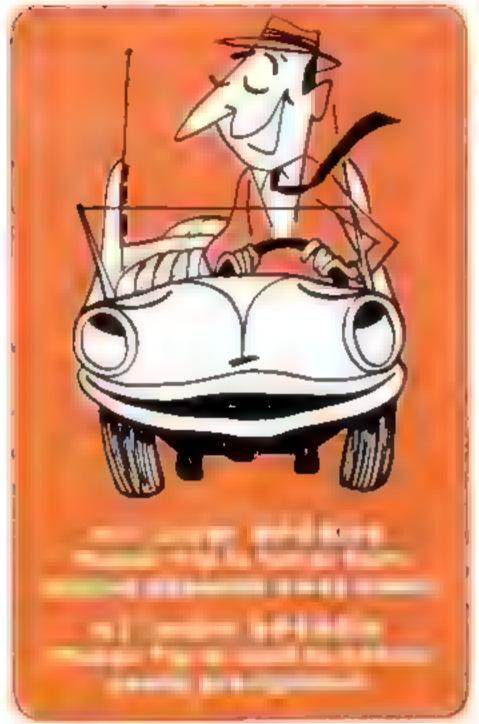
Rochester-GM Carburetor specialists are tought the expert techniques of maintaining your Rochester-GM Carburetor in training schools throughout the country.



America's number one original equipment carburetors

BURETORS

# AUTO-LITE, RESISTOR SPARK PLUGS WITH POWER TIP





Power Tip cleans itself while you drive!

#### How to Drive and Stay Alive

It's like crossing a battlefield under enemy fire. They're shooting at you.

"If you cross a battlefield where there's a lot of shooting you're going to get hit sooner or later. If you cross where only a few bullets are flying, you may survive.

"I pick roads the same way. I study a map. If one route looks full of twists and hills, I know they're going to be 'shooting' at my car on every turn or hilltop. I also avoid roads that serve several busy towns or heavy industrial areas, and roads that have many intersections. These are high-hazard roads.

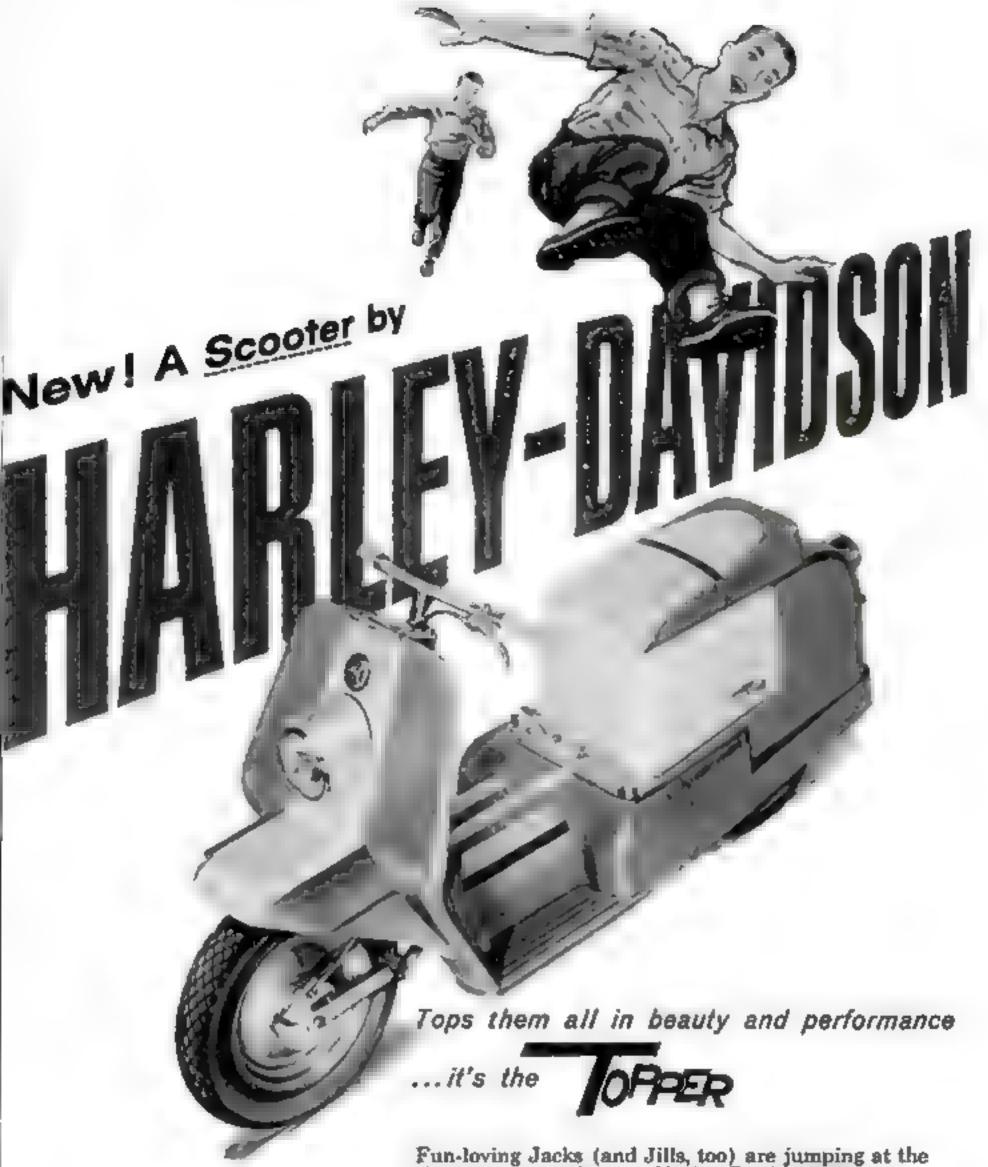
"If you want to play it smart, stick to low-hazard roads. These are straight, wide, free from intersections. If possible go by one of the modern tumpikes or expressways. Some of these are six times safer than paralleling roads. When you move over onto the tumpike, you cut your accident chances this year from one in eight to one in 48!"

Or, to put it another way, on ordinary roads, if you're "average" you're mathematically likely to have an accident within the next eight years. But if you pick high-survival roads you may go for 48 years in complete safety.

#### **Dunked motor runs in bucket**



A special insulation system keeps windings, bearings and magnetic parts dry as the General Electric motor above operates immersed in water. It is designed for boiler pumps and underwater uses.



Fun-loving Jacks (and Jills, too) are jumping at the chance to meet the new Harley Davidson Topper. And why not? There's not another motor scooter like it — combining clean, smart beauty with the newest mechanical secrets of success. Scootaway automatic transmission makes riding a snap...lowest center of gravity makes handling a dream. See the new Topper at your Harley-Davidson dealer. Or write for free, colorful folder.

#### HARLEY-DAVIDSON MOTOR CO.

Milwaukee 1, Wisconsin, Dept. PS

World's leading manufacturer of lightweight motor vehicles



On tour or around town, drive with Quaker State, the oil that cuts engine wear, preventa engine breakdown. Fortified with anti-wear detergent additives, this pure Pennsylvania oil stops rusting and corrosion, eliminates sludge, carbon deposits and damaging acid action. Result: moving parts work smoothly and friction-free under all driving conditions! Next oil change, insist on Quaker State.

QUAKER STATE OR REFINING CORPORATION, OIL CITY, PA. Member Pena, Grode Crude Cill Assa.

1859—and Founding of the Petroleum Industry—1959

#### First Really Portable TV Set [Continued from page 67]

had to match the quality of ordinary nonportable "portables," It did.

POPULAR SCIENCE latched onto one of the first two built, and staff members tried it out in different places. All reports were favorable.

The picture. Quality is excellent: crisp, detailed, natural in tone. The first few sets off the line were afflicted with "center stretchout." Thus gives performers elongated torsos. It has been corrected, and you now get a distortion-free picture. The optical magnifying system does not seem to harm the picture at all.

Sound quality is average for TV: far from hi-fi, but satisfactory.

Sensitivity is remarkably good for such a compact receiver. We took it to the hilly suburbs 50 miles north of New York City, where reception is tricky. The Safari pulled in a picture on its own whip antenna. A table model beside it couldn't get a thing without a rooftop aerial.

We also hauled it out to Jones Beach. where the cover photo was shot. There, with bright summer sun glittering off white sand, the picture could be seen comfortably by moving right up to the small built-in visor. No other shading was required. The Safari has turned in similar performances aboard moving cars, planes and boats.

Operation is simple. You just flip the visor open and work the usual control knobs on the side. A flap on the back opens to reveal the plug for the power cord (for home use) and a knob that switches from battery to AC to batterycharging. Another flap on the bottom lets you change batteries. Beyond that, there's no easy access to the inside; Phileo wants it that way

Why it works so well. The Safari circuits are conventional, allowing for the changes imposed by transistors. There are 21 transistors of the PNP type, 12 solid diodes—and two vacuum-tube di-

odes (high-voltage rectifiers).

Two printed-circuit boards clearly marked—like a road map—simplify trouble-shooting. They form two sides of the chassis, with the picture tube and battery filling up most of the space in between. It makes a neat, compact and efficient assembly that pays off in convenience and performance,

# **World's Smallest Precision Adding Machine**

its In Your Pocket! Saves You Time, Money And distakes! Perfect for Sportsmen, Salesmen, Students, lousewives, Businessmen, Storekeepers, Etc. Adds and Subtracts Up To 1,000,000 In Seconds!

#### IT NEVER MAKES A MISTAKE

HAT IT WILL DO FOR YOU: **BALANCES CHECK BOOK** KEEPS YOU ON BUDGET CHECKS GROCERY TAPES DOES HOME WORK TOTALS SALES SLIPS CHECKS SCORES TOTALS CAR MILEAGE DOES 1001 OTHER ADDING AND SUBTRACTING CHORES - EACH IN SECONDS

DM WEST BERLIN, BERMANY, COMES NEWS OF AM AMAZ-I time saving, work caving, mency saving lavaution. The rid's emailest, precision made adding machine that adds to 1.000,000 . . . subtracts to 1.000,000 . . . does it in ands . . . oné agrer makes a mistake!

ine that saves you dless hours of mental ork every year . . . ves you time . cuts t contly mintakes a you check bills,

beautifully made ma- | your budget, keep scores and perform 1,001 other adding and subtracting chores . . all in a matter of seconds and without a single men-

tch errors, add up tal effort on your part' **YOURS FREE** 5 MULTI-COLOR ALL POINT PENS **PLUS** 15 VISIBLE VIEW REFILLS

lorful infetime polyrrene plantic cases . . . th silver-tone bands, saving or novelty uses. ver-lose milver-tone p-and the same exnsive push-button schanism as on \$5 ns! Enough pens for in the middle of a letter. ur entire famuy!

agine! All 5 deluxe Rold-writing pen to ilticolor ball point emboss wallets ... to ne with gleaming and aign gift cards . . . for invitations . and e hundred other money-

In addition get 15 Visible View Ink Cartridges without cost! No more running dry

ALL AME YOURS FREE Just And each writes a dif- for frying the WORLO'S rent color ' One writer SMALLEST PRECISION ADDING ue, one black, one MACHINE in your home for een, one red, and one one west without risking a \$3.98. Mail Free Trial ites in gold! Use the peary. Coupon Today!

4 MILLION ADDIATORS IN USE, SAVING TIME, WORK AND MONEY

Used By European Governments, Giant Firms Throughout the World!

#### A Gorman Invention

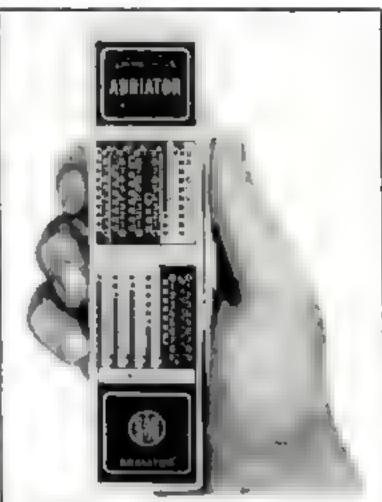
The secret is a scientific principle acknowledged to be perfect by experts throughout the world. Developed by German scientists, AD DIATOR is now being used all over Europe Pan American Airways. American Express and other companies as well as millions of people like you in 51 countries use and rave over ADDIATOR.

From all over come reports of nerve-wracking additions of long columns becoming easy of the as a game the sureness speed .

the simplicity of this week free. miracle machine! Think what this means to you Now at last you can check everything you buy . . , every bill . . every statement . . . and never lose a penny be- bills in seconds totals self or for a gift, mail the cause of mistakes. You your gracery bills like free trial coupon today. can add up your budget . .. check your children's school work . . . ndd up checks . . inventories .. records of car mileexpenses, keep track of what you spend each day . . yes, do 1,001 everydwy ailding and subtracting jobs.

#### Morvel of Busine Nover Needs Repairs

Not a toy-not a gadget. Amazing ADDIATOR and all its moving parts are constructed entirely of aluminum or brass. It insts a lifetime and all that amazing new ADDIATOR costs is



ADDIATOR is Super Accurate — Super Fast i

Add or subtract the longest columns without effort. Addiator checks bank statements in seconds , checks bins , , , budgets , , , does homework NO MORE MISTAKES, keeps a running total, automatically !

#### FREE TRIAL OFFER

No longer do you have to lightning one makes of being too lazy mi rage ATOR without risking a MAKES A MISTAKE. penny. All you do to mult the no-risk free trial coupon below in a few days ] ADDIATOR will be deliv-20 gifts. Can it for one

See how beautifully constructed it to ... how may to read the numbers . . . operation.

See for yourself how ADDIATOR adds up your

checks your be a slave to figures. Avoid bank statement in nothing the costly mistakes every- fiel .... , figures up your does 1.001 adto check all bills and state ding or aubtracting Jubs ments. Try amazing ADDI for you and NEVER

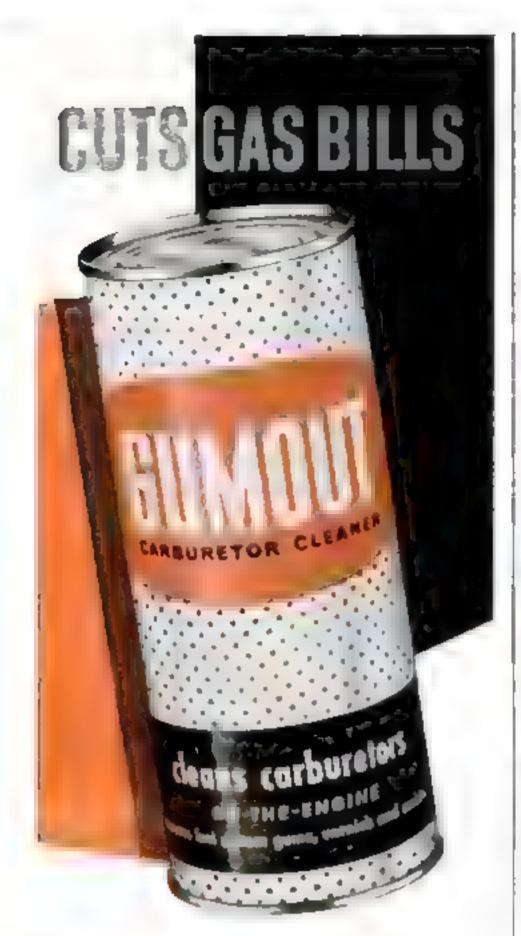
Use it to check golf. bridge and other acores. Let your children check their homework in seconds. ered to your door with all Put ADDIATOR to every test. If you don't agree it w . have you endless time, effort, and money, you have used it ent rety free. It won I cost you a penny how smooth and ellent the This free trial offer may not be repeated in this magazine this year. To get your ADDIATOR for yourtotals self or for a gift, mail the

#### MAIL FREE TRIAL COUPON TODAY

MANRISON HOME PRODUCTS CORP., Dept. PS.S

- Please rush my ADDIATOR, & free ball point pens, and it free refile with full money back guarantee.
  - ( ) \$2 50 enclosed. I save all C.O D. charges, ( ) Send C.O D. I will pay postman \$3.05 plus C O D. postage.
- Please rish my ADDIATOR DELUXE, & free deluxe ball point pers and 14 free deluxe refills with full money back guarantee.
  - ( ) \$6.95 perfored. I save all COD charges.
    ( ) Send COD I will pay postman \$5.95 plus C.O.D. charges.

Name		 
Address		
City CANADIAN CURTOMERS	Dodge Press B	 



gum to your carburetor. This build-up can reduce gas mileage as much as 10% And at today's prices that costs you about 3c a galion

You can easily beat this problem by cleaning your carburetor with Gumout Simply add a can of Gumout to your gas tank It cleans the carburetor as you drive.

You'll get smoother engine performance and, best of all, you'll get more miles for your gasoline dollar. Gumout is sold by most service stations and auto supply stores



#### 194 POPULAR SCIENCE AUGUST 1959

#### The Gremlins in Printed-Circuit TV

[Continued from page 166]

a ringing sound and some sparks. As I turned to the screen—half expecting to see three lemons—the sound came back.

"What did I tell you?" asked Kate.
"But this is murder on my allowance."

"Where did you learn that trick?"

"One of the kids did it for a gag when the sound went, It worked. I've been paying in quarters ever since."

"Let's take a look," I said, removing the back of the set. The chassis was com-

posed of printed circuits.

I got out a magnifying glass, a needlenose pick, a can of plastic spray, a tubesocket adapter and my 35-watt soldering iron. I use a low-wattage iron. A printed circuit is a laminated-plastic board with copper foil bonded to one side. Too much heat will break the bond.

As I removed the coin from between the circuit board and the metal frame, the sound quit. Then I installed the tubesocket adapter under the audio-output tube and took voltage readings. They all checked until I touched the screen grid of the audio-output tube. There should have been plus-175-volta DC. I read zero.

Attaching the meter probe to the screen test point, I pressed the circuit board gingerly back and forth, Sputters came from the speaker. The meter needle rose to 175 and fell in beat with the sound. I held up the magnifying glass and examined the solder joints leading to the tube's screen

And there it was—one of the most common printed-circuit troubles. A cold joint. (Factory soldering is done by machine and occasionally a joint won't take.) Wedging a quarter between board and frame pressed the joint together and current flowed—probably until speaker vibration from the rock-and-roll beat and the kids dancing knocked the coin loose.

With the hot iron, I placed a minimum of solder on the cold joint, It took. Then I sprayed on plastic and reassured Kate. "Your TV is now legal."

"You're a doll," she said, "Will the bill take what's left of my allowance?"

"Not when we've hit the jackpot," I answered, grabbing a fistful of quarters from the bottom of the portable.

"Golly, did I put in that many?" She counted the quarters and giggled. "I can't see why Daddy is against slot machines."

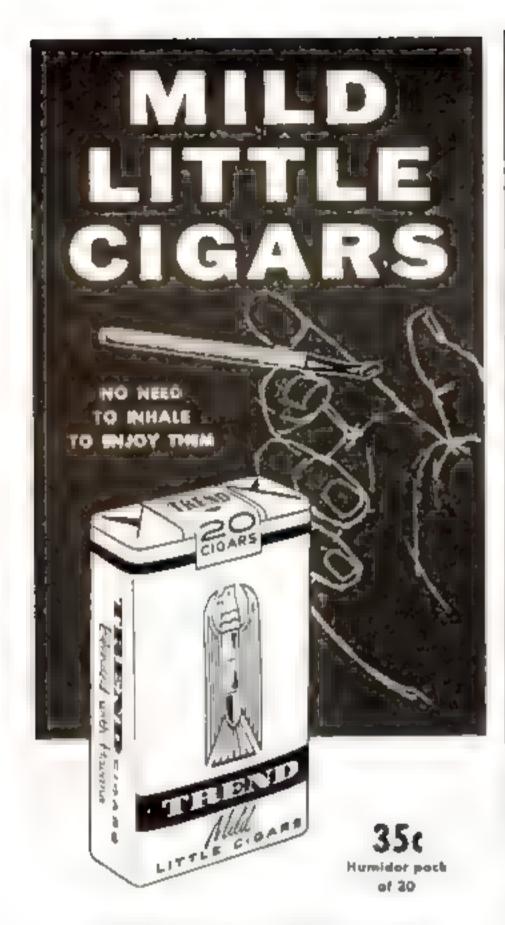
IS IT? WHAT

**EPTEMBER** 

POPULAR SCIENCE

FOR ALL CONTEST DETAILS

A SPLIT-LEVEL SOMETHING NEW IN



# TREND

- Long enough for complete satisfaction , , , short enough to enjoy any time.
- 100% rigar tobaccos—with umform tobacco wrapper.
- · No need to inhale to enjoy them.

Try them today ... the milder little cigars in the modern size. Carton includes free cigar holder.



# Tipt

New Filter Tip Little Cigar

40c Hemider Pech of 20

Filter-tip protection . . . true cigar flavor . . . convenient modern size.

STEPHANO BROTHERS (Cigar Division) Phile. 7, Pe.

PROBLEM IN MOBERN LITTLE CIGARS .

#### Detroit Report [Continued from page 48]

ers—long accustomed to a high, comfortable seating position. This is regarded as a major factor in Chrysler's decision to adopt the new construction method for the coming model year.

Pit crew work at the Indianapolis 500 this year was astonishingly precise. Winner Rodger Ward's three pit stops totalled only 73 seconds—averaging less than 25 seconds each for a change of tires and full load of fuel.

Fastest stop was by Paul Russo. His Bardahl crew changed tires, added fuel and had him on his way in an amazing 19 seconds. This was outstanding, but most stops were made in less than 30 seconds, except when mechanical repairs were needed or the driver stalled his engine and had to restart it.

Built-in jacks were used on some cars for the first time this year—and very successfully. Ward's car had them; so did Jim Rathmann's (second place) and Tony Bettenhausen's (fourth place). They snap down to raise the car when a crew member hooks bottled nitrogen under pressure to a fitting, and retract automatically. Many more cars will use them next year.

There's a rumor building that Buick's Triple-Turbine Dynaflow automatic transmission may be dropped come 1960. Lack of sufficient demand and high costs are reasons cited.

Evidence is piling up that both Ford and GM are planning additional compact models. Much will depend on public reaction to the Falcon and Corvair.

Ford engineers definitely are working on a front-engine, front-drive car with a six-cylinder aluminum engine. GM is continuing efforts on a small aluminum V-8 for a front-engine, rear-drive car that would be marketed through Buick-Olds-Pontiac dealers.

Although both programs are well advanced, ultimate to-build-or-not-to-build decisions will be delayed as long as possible so acceptance of first compact jobs can be judged. Discount any reports that indicate the second batch of smaller models will show up before the normal 1961 model season—the fall of next year.



h toards (6 to 40') Wood, ware and 8 pg Armor Giasa books. Plywood and Steel, Sond 356 (SPECIAL OFFER) for 120 pg. Pien Catalog.

atmog pass "Boat Budding All 3-colored CATALOGS plus "Boating Handbook" all for \$1. Mandbook . . Send \$1.00.

Buffalo 7, N, Y.

#### POWER TOOL CATALOG

Get the right tool for the job! Write:

World's largest maker of electric tools

ECUSTOM • CRAFTI

Dapl. 5089, Towson 4, Maryland



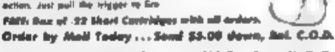


#### Get New 132 Page Catalog of SHU MODEMEDICHE **州西下田田 (本山**島

WORLD & LANGEST SELECTION LOWEST Prices we of their brack or between a of the want man had be find their AND PASSETS OF IN THE SET OF A SECURITY PROPERTY OF A SECURITY OF A SECU

#### LOWEST PRICED .22 Col. REVOLVES AVAILABLE BENT & Shot .27 Short Double Action CORT S1S. 98 -649:95 Value

Only Godfrey Core could find a province 23 Cpt Revolves today for \$15 TE Small EX-Thuppy 32 Cpt 19AL Breaker can be dipped into your pocket or ter. Can be said for horeing the trappings Saint stool borred gives close-up on survey. Quick grip: fearables, it, fact feeding double-action, Just pull the region on line.



GODFREY OMPORT CORP., Bugs. PS-2, 241 Browlings, N. T. T.



# "We Can Make Money Together"

#### And You Will Have Your Own **Automotive Wholesale Business**

Imagine yourself in a profitable business of your own. One that could give you a better home, a better car and even college for the kids.



"Soul Fast" Days.

A pipedream? Not if you are willing to work and can make an investment of about \$8,500 for truck and stock.

You start in a solid, depression-proof business in three or four weeks. You will call on service station operators who count on you to supply them with

products they must have to run their business.

We know what kind of man will make a business like this go. And we will show him exactly how to get started. What's more, if we pick you, you will be thoroughly trained until you are well on your way to a substantial income from a "protected" territory of your own.

If this is what you are looking for, send for a free copy of our booklet, "So You Want To Be Your Own Boss!" Naturally, you won't be obligated in any way. Mail your request to: Mr. Charles E. Bowes, President, The Bowes "Seal Fast" Corporation, 5902 East 34th Street, Dept. 308 Indianapolis 18, Indiana.

Bowes Distributors throughout the country are part of a multi-million dollar operation. They represent a firm which in 40 years has grown to be one of the largest of its kind, with plants in London, England; Hamilton Ontario; Riverside, California, and Indianapolis. Its credit rating is the highest (AAA-1) available.

# \$325 GAS FILTER CURES YOUR CAR'S "HEART FAILURE"!



# Prevents Flooding and Stalling By Keeping Your Gas Supply Clean

Until recently there was no really effective way to protect your car's "heart", the carburetor, from tiny specks of gas-tank dirt that cause flooding, stalling, and poor performance. Then Carter Engineers got busy on the problem.

Result—the new Carter In-The-Line Filter—with an exclusive ceramic unit and Magnatrap® that stop dut and metal particles .0012 inches and smaller! You can install it in minutes just by removing 4¾" of the fuel line and fitting it in place. Neoprene hose and clamps supplied.

The Carter In-The-Line Filter is available at service stations and garages everywhere!



Install between fuel pump and carburetor.

Three sizes fit all cars.

FREE! Easy-to-read booklet with more details about how the new filter works, and how it protects your carburetor from flooding, stalling, and 'eromon'. Write Dept. No. 820-PS8

#### CARTER CARBURETOR

ST LOUIS 7. HISSOURI

Crashed Airliners Fly Again
[Continued from page 1/8]

used bulkhead in Belem, the idle wingspar in Woonsocket, and the gear strut in Ghana?

At that, he was lucky the job wasn't in Europe. There, he'd have to consider another set of metal standards, measurements to the metric scale, even different threads on screws.

He and his team sat down and quoted a figure. After much dickering between airline and insurance company, it was agreed the airplane would be patched, flown back to New York, and returned to service as soon as possible.

Says Bill Mueller, "We threw a Band-Aid on that one. Neal had a 'barrel' shipped in—about ten feet of fuselage section from a hangar queen in Miami. We hoisted this into place with a fork-lift truck. We positioned it on a wooden cradle, then edged it up to the plane by driving wooden wedges under the cradle. Angle irons patched the rings.

"The whole arrangement was held together with aluminum patches outside of the skin."

He paused. "Sometimes, they go through a routine that always shakes me up. They think a plane is jinxed if it has cracked up. So they make a big ceremony out of changing the number. Then they invite you to get in and fly it home. In fact, they insist on it."

LASNY's pilot successfully steered his splinted bird between updrafts all the way from Barranquilla to Miami—and ran into a squall over Miami International Airport. Says one of the mechanics, "Every time we hit a bump, the whole back end of the plane flapped Or at least it seemed that way. If I'd had some rivets, I'd have put them in by hand."

"Landing accidents keep us busiest," says Thomas. "A big part of our job is picking up planes off the runway." Take the case of the copilot who reached for the flap handle just before his Stratocruiser greased onto the runway—and pulled up the landing gear. The pilot poured on the coal to haul her off, but she was flying too slowly. The plane ground off the bottom half of her fuselage on the concrete, then settled to rest in the boondocks.

A pilot of a domestic airline plowed



BE FREE FROM TRUSS SLAVERY
Burely you want to THROW AWAY TRUSSES FOR-EVER, he rid of Rupture Worries. Then Why Do you put up with wearing a griping, chafing and unsanitary truss the balance of your life? If you do, it will NOT he through necessity but through choice on your part.

Now there is a new modern Non-Surgical treatment that is designed to permanently correct supture. These Non-Surgical treatments are so certain, that a Lifetime Certificate of Assurance is given. Write today for our New FREE Book that gives facts that may save you painful, expensive surgery. Tells how non-surgically you may again work, live, play, love and enjoy life in the manner you desire. There is no obligation. Excelsion Medical Citals, Bept. M6224, Excelsion Springs, Mo.

FREE Send for this free folder on the finest took made. Drills, saws, hand took, the foreous Dyno-Mile® Workshop, and many more.



MILLERS FALLS CO. Dept. P5-30 Greenfield, Mass.



#### BIG NEW CATALOG—FREE

Describes and illustrates over 3000 Starrett Tools. Write for it. Address Dept. PS



THE L. S. STARRETT CO., ATHOL, MASS., U. S. A. Lines 1880 - World's Grantest Toolsunkers

#### ENJOY YOUR OWN

No special experience required

A shop in iteelfrtometik, faciproof.

A STREET

Down payments

Beliance in low

from earnings.

monthly payments



STAND-ALL Model 7 SHARPENS 10 types of sows, including rip and Cosseut handsaws, hocksaws, bondsows, circuor mass

RETOOTHS sows of 5 to 16 point sixe. CROWNS—adjusts

any standard crown. HOOKS from -5 to 21 degrees.

BEVELS from 0 to 30 degrees.

SMITH-NIELSEN EQUIPMENT CO., Mfr of Saw Grinders 903 M. NORMANDIE - SPOKANE, WASH. - FA 8-9680

#### Simplifies Complicated Measuring



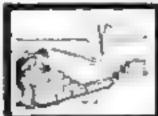
Easy as a camera to operate! One man - ALONE can do leveling and incline measuring. Accurate to a fraction of an inch Many uses on the job and around the house

Carpentry Leveling Contour Plowing Patio & Terrecing Duct Installation Foundation Work

Brick Laying Yard Grading Irrigation

Guttering Dramage Masonry ETC.

Guaranteed Product Satisfaction







If not available at your Building Supply or Hardware Dealer, write directly to:

HOPKINS MANUFACTURING CORP.

Dept. PS-5

Emporia, Kansas

Another Quality Product by HOPPY



#### Crashed Airliners Fly Again

into a snow drift on a hot landing, snapped off two wheels, and skidded 1,000 feet on one wheel and a wing.

A European pilot, taxiing out to take off with 100 transatlantic passengers, heard a noise like a gunshot and felt his airliner sink to the runway. A wheel had collapsed.

These pickup jobs are often full of surprises. Thomas tells about a hurry call he got to fly to Maiquetia Airport in Caracas. The wire said that the pilot had taxied off the ramp and snapped off the right landing gear in deep mud. The left wheel was still on concrete.

When Thomas arrived, the plane was on her side in six feet of Venezuelan ooze. The outboard engine nacelle was resting on the ground. But a few questions later he said, "This one should be easy."

The crew cleared away three or four feet of mud and made a ramp of boards down to the right wheel. Thomas lashed a line to the tail and gently hauled the plane up the ramp to solid ground. As he had guessed, the gear was not broken at all. It had merely been buried, and in all the excitement, no one had bothered to get down in the coze to look. But it's not always that easy.

How do you lift a 50-ton hulk that's flat on the ground? A hulk as big as a house? Especially if it has come to rest on the mud flats of Jamaica Bay, N. Y., the way a DC-6 did recently.

Bill Mueller tells the story. "That Six was in the middle of New York City, but it might just as well have been in the South Pacific. We couldn't get to it. The only land approach was over a spur of the City subway. We had to carry in all our gear by hand." Standard gear includes hand tools, stout line, cable clamps, lamps, a generator, power saw, and mattresses. "Mattresses," says Mueller, "protect the fuselage when we have to sling steel cables around it."

You can raise a 50-ton airplane several ways: If the spars are not cracked, you slip an I-beam under the wing and lift the beam with a pair of cranes. You can do the same thing with the special low-profile jacks developed for crash repair.

If the plane has a broken wing, you slip Goodyear lifting bags under the fuselage. A few pounds of air pressure will

# GUNK-it-yourself!

Gunk® G.P. removes grease from engines or concrete floors; cleans paint brushes, power mowers, or machinery completely, economically, safely. It's ready-to-use, rinses off with water, won't clog drains. Quart size with handy "Squirt Spout" top speeds application. Insist on the best degreaser—the original "GUNK" at better automotive supply and hardware retailers overywhere.





GUNK CHICAGO CO., Niver forest, Minels Committee of Factories the Midwest and Southwest Charlette, No. Committee overlap the Sections and Society State

# MAGNETS ALNICO

FOR HORRYISTS, INVENTORS, SCHOOLS, FISHERMAN & INDUSTRY
Frompt delivery, If not satisfied in him days money back
8-2 Gay Surp. Ander Retrievers pull 250 lbs on steel block \$14.00
B-21 Retriever pull 125 lbs. on centre steel Nock 9.50
8 23 Hetriover putt 60 (bs. on centre steel black 6.50
2-28 Retriever pul) 50 (to, on centry steel block 4.50
\$ 29 Midget smallest retriever ever-pull 12 ibs 4.40
8-32 Pick up Youl & 10 Hut Pad Magneta
\$ 33 Assertment of 12 small magnets 150
\$ 35 Pencel type magnet 2 for \$ .00 25 for 10 00
8 37 20 seatd. & pick up tool & 5 ibs, poll horse shee 3.00
6-38 Horse Bhen Magnets gulf 4 lbs 2 fer 1 00
3-39 Bulletin Board Magnets 10 for \$1.00 30 for 4.50
Send M.O. or check. We pay partoge, Ne C.O.D.
HOLLYWOOD HOUSE OF MAGNETS, INC.
6912 Nollywood Blvd., Nollywood 26. Calif.

#### FREE! DELTA HOMECRAFT CATALOG

A valuable addition to your home workshop library! Pictures and describes every tool in the world's most complete line of power tools for home workshops—includes individual, combination and all-purpose tools. Tips on tool care, handy "how to" hints, plus details on hundrads of money saving accessories. Writes Rockwell Manufacturing Co., Delta Power Tool Division, 504-H N. Lexington Ave., Pittsburgh B, Fa.

#### DO MORE PLANING JOES WITH LOW COST BELSAW (COM DOW)



Enclusive Minter Marino, Fratures and Cast Terrors

1244 a 5" connecty - Provide foods at 14

to 34" a minute - Provides for Cristling Knows in the Cattur-hand - Attachments for Josephing, Rabbeling, Tongue, Matching, Groove, Convert low cost rough lumber sets high priced stock, Easy to make theoring and process pothers. Send Today for FREE Literature and Prices

Beleaw Machinery Co. 2060 Field Bidg., K.C. 11, Mo.



More aluminum, lighter weight, better performance, beautiful styling. Still World's Lowest Priced Car. Drive it for 75¢ a week. Rider Agents Wanted. If no dealer near you send 25¢ for 32 page picture book, full details, dealer price, or send \$1 (refunded first order) for this and Service Manual plus Repair Manual and 15 5x7 photos of ear and factory.

MIDGET MOTORS CORPORATION, Athens 2, Ohio

# HOW FLEET OWNERS GET 200,000 MILES FROM STOCK ENGINES



# Truck and cab operators replace key parts... get like-new engines for worry-free driving

Let's say you've got a good car you'd like to keep. Trouble is, it burns too much oil... can't get by a gas pump; and at traffic lights, you're left behind in a cloud of exhaust. Well, owners of fleet cars with stock engines just like yours know what to do. Invest in an engine overhaul, replace key parts like bearings and rings, and get a car that runs as good as new!

#### WHEN TO OVERHAUL?

Worn engine bearings are easy to diagnose. Among other things, they cause oil burning, engine misfiring and knocking, poor gas mileage, sluggishness and loss of power. Spot the symptoms in your own car? You need an overhaul, and new Federal-Mogul engine bearings.

#### WHAT TO REPLACE?

An "overhaul" without new engine bearings is no bargain—you can tell after a few miles. Then you put up with it, or pay to do the job over. So make it right the first time! It costs just a few dollars more, and it's worth every cent of it.

#### WHY FEDERAL-MOGUL?

Your engine depends on bearings—main, connecting rod and crankshaft. Federal-Mogul



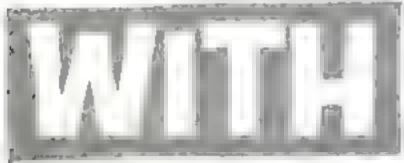
bearings are the world standard for quality and precision. Yet it costs no more to use the best! Ask your mechanic.

# FEDERAL-MOGUL SERVICE



Division of Federal-Magel-Boose Boarleys, Inc. - Detroit 13, Michigan













- MEANT ROOM
- · Remove old finishes easier, faster
- Non-inf ammable and needs no afterwash
- · For wash-off or scrape-off use

# 25%

#### Heavy-Bodied KLEAN-STRIP

THE KLEAN-STRIP CO., INC.

2340 S. Lauderdale, Memphrs 6, Tenn.
202 POPULAR SCIENCE AUGUST 1959

#### Crashed Airliners Fly Again

lift the plane several feet. Then you set it on piles of railroad ties until you can tow it away.

With salt water lapping at the floor-boards of the DC-6A, etching the electrical cable and corroding the engines, the squeeze was on. Owners' orders: "Get the plane out of the water. Repair it later."

Under Bill Mueller's direction, a crew dug two trenches four feet wide and three feet deep under the wheel wells. Two barges filled with concrete were slid into the trenches. With solid support now for his jacks, Mueller inched the plane upward until he could lower the wheels. Then he built a ramp from the sunken barges to a flatboat in deep water. The boat floated the Six back to LASNY. It was one of the few times in history that a land plane taxied across Jamaica Bay. Total time: 32 hours.

Salvage is tough on Neal Thomas. If a luxury airliner lies sprawled across a busy runway at a big terminal, the airport operator puts the screws on him: "Get it out of the way or we'll bulldoze it into the mud. There's a dozen planes in the stack." Sometimes he works in rain or snow for 40 straight hours without sleep. Often he spends six months within the Arctic Circle or at the Equator.

But he gets a deep satisfaction out of raising a crippled giant from the mud and sending her aloft again. And there are always little surprises.

A domestic pilot dropped a DC-6 into the sand outside Fallon, Nev., one blustery wintry day not long ago. In the rush to leave New York, Thomas forgot to take a hat and the stores in Fallon couldn't fit him. On a long gamble, he climbed into the tilted airplane and ran his hand the length of the cabin hat rack. Nothing.

Then, through the leaning doorway to the lavatory he spied a handsome, pearlgray, ten-gallon Stetson. Forgotten in the haste of disembarking after the crash, it was obviously the in-town hat of a man of means. Probably the bold and forthright type. A Texan, no doubt.

Thomas jammed it on his head and grinned. A perfect fit. "But," he says, "I still haven't figured what the guy was doing in the 'head'—when that Six bit the dust—with his hat on."

## Only Consistent Feedings of Specialized Lubrication To Upper Cylinder Areas Prevent Cars From Ageing Into Powerless, Sluggish Misfits

Thousands of car owners agree this is the only way to maintain "the peak power performance of a new car", ... enjoy a smoother quieter engine for years. Engines keep their pickup zip! Engine repairs practically nit!

NOW ... THE ANSWER TO REGULAR FEEDINGS . . Quitomatical **INVERSE OILER** 

> Operating off the intake manifold, this completely automatic oiler feeds world-famous MARVEL MYSTERY OIL to the upper cylinder areas in exact proportion to engine load and speed.

Just keep the Oiler filled ...and forget it.

12 drope

EMEROL MFG. CO., INC. 331 North Main Street

MARVEL INVERSE DILER new available at mest dealers. Surpris- i ingly low in cost! Installation Kits for all cars. Write Dept. PS for free information.





Item #391

Type D-2—carbon steel

Capacity-500 cu. in. (approx. 2 gols.) 450 sta PSI  $\frac{1}{4}$  port at each and. 24" length a 6  $\frac{1}{2}$  of a

2 for \$12.50

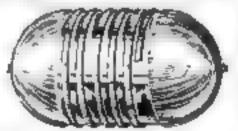
\$6.93 ec.

#### STEEL TANKS

Bargain-Priced for Fast Selling!

Ideal for compressors, tire inflators, floats, buoys, pulsation chambers, hydraulic reservoirs, fuel containers, fluid and milk containers, etc.

> Strong! Light-weight! Used as aviators' exgen bottles,



Herm #63

Type G-1 — stolniess steel Capacity-2100 cv n (9 pa i ) 450 # 5 1 1/4" port of each and 24" length a 12" dis. Wgt

F.O.B. Chgo \$14.95 ec. 2 for \$27 00

#### FILEEL New, Big GROBAN Catalog

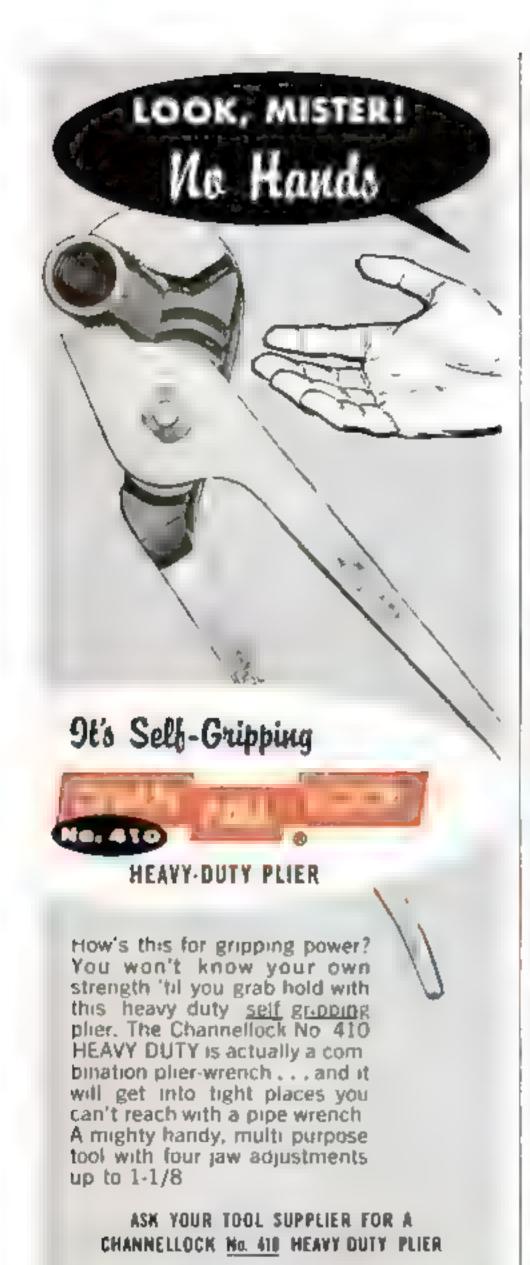
Valve-packed pages of war surplus and newly manufactured equipment-Berguine for form, home, factory, workshop! WRITE TODAY for your free copy!

#### GROBAN SUPPLY

DEPT. PS-0 1139 S. WABASH AVENUE

#### COMPANY

CHICAGO, ILLINOIS Withster 9-3793



# CHAMPION DEARMENT TOOL COMPANY

THE POR THE TROPHARE ON THE HANGLE

How Safe Is Our A-Ship Savannah?
[Continued from page 108]

slightly enriched in uranium-235. Like the Shippingport reactor, the floating one will deliver heat to make steam and run turbines. Instead of driving electric generators, however, the Savannah's turbines will turn the ship's single screw through reduction gearing. Should the A-plant fail, diesel-electric "take-home" power will be available.

Atomic strides. Since 1955 when the U. S. S. Nautilus signaled "Under way on atomic power," nuclear energy has propelled military vessels—U. S. submarines, and, more recently, a Soviet ice-breaker. Now the Savannah marks the advent of A-power for merchantmen, which will free them from carrying huge tankfuls or bunkerfuls of fuel. The space thus saved can then be devoted to profitable cargo.

How safe? Our A-subs have churned the harbors of cities as populous as New York, Rotterdam, Oslo, Le Havre, and Cherbourg. But England has cautiously preferred to receive their visits at remote Portland (population 12,000); and Denmark, worried over a scheduled visit of the Skate to Copenhagen last year, canceled it entirely.

Behind such anxiety and uneasiness has been concern lest an atomic catastrophe might result if an A-sub should be in a collision or run aground; and the same questions are bound to be asked about the Savannah. How safe will she actually be?

When the Savannah's atomic reactor has been running for some time, its uranium fuel rods will contain a potent quantity of radioactive fission products. Safety demands guarding against any possibility of their escape—either into the air, as a dangerous radioactive cloud, or into the sea as noxious contamination—despite the most violent accident that could possibly befall the reactor or the Savannah.

To this end, the ship's reactor and boilers will be sealed within a massive "containment vessel" 51 feet long and 35 feet in diameter, made of steel two and a half inches thick. Accompanying illustrations show how it would prevent escape of dangerous radioactivity despite a reactor meltdown, the worst possible collision, or even the ship's sinking.



150° above zero and 65° below zero

In government-supervised tests, the Bendix\* Electric Fuel Pump worked perfeculy in temperatures ranging from +150°F, to -65°F,-a record no other fuel pump anywhere near its price class could match. This best-on-the-market Bendix pump prevents vapor lock, delivers a constant flow of fuel. You'll start and go better in any weather with Bendix. PRICE BIS. PAT SPY.



Edipse Machine Division Elmira, N. Y.

I GOR users. Statement short, 37.95
Won't rist of rangi Uara 1/6 37.95
IIP motor of larger 46 EP
Inc up to little to bill, 430 GPE 80' high;
or 1880 GPH tenn 25 wet 1" talet;
M' of let, Coupling the order free
Newly Duty Ealt Bearing 27.2.95
Pump. Up to 7.500 GPE \$7.2.95
It's twict; I' milet
Foripoid if state with order, Also other place, Spice.
MONEY MACK QUARAMTEE.

LABAWCO PUMPS, Mend 2,

WATER TSTEM Completely Astemulic 49.95 With to HP from a \$40 DE

(\*140 7 40 for 20 40 for From Circular

RE-POWER NOW with a V-B major-Use **CHEVROLET** 

in 2 or 4 Whi-Dr. Jeeps, Jeepsters, Sta-Wgm, Trucks. M.J. and Ratter cars. Conversion Riss 543 25 to 538 85 if you want fast action tell as which angine you wish to use give as year, Model, (2 or 4 Whi-Dr), of your vehicle Send Min. 515 00 Dep. and we will ship correct bit. Ma) COO Send tylt amt for Propaid shipment, Wire, phone or write for free details. (Associate for Ford 6 engine.)

S14 B.E. Sth St. Phone CRE-3442 Pandicton, Orogan

## CUT HIGHWAY of 4-Wheel Drives!



With Warn Hubs, your 4-whiel drive reels of highway males fast in free-wheeling 2 w.d., takes the rough stuff in 4 wid as usual, With the front drive standing still to 2 w.d. there is no gear wear or white-whicle has amazing pup, handling case. Use 2 or 4 w.d. at needed, automatically with Warn Luck-O-matter, manually with Locking Hubs. Unconditionally guaranteed. San year local 4 w.4. dealer soon?

NAMIN NES. CO. Riverten Br 4064-B, Scattle 22, Wa.

#### NEW MARLITE RANDOM PLANK

beautiful wood-grain paneling you can install yourself!

Add extra luxury to any room with new Marlite Random Plank. The 16"-wide planks are 14" thick, tongued and grooved for easy instanation, Six exclusive new Trendwood finishes capture the heauty of fine woods in a random-width paneling effect. And Marlite's baked plastic finish resists stains and mars, requires no painting or further protection. See your building materials dealer or write for free decorating book. Marlite Division of Masonite Corp., Dept. 826, Dover, O.

plastic-finished paneling

ANOTHER QUALITY PRODUCT OF MASONITE® RESEARCH

# **America's Finest** Car Care Combination MAC'S-IT KIT

MAC'S SPECIAL CLEANER quickly temoves road film and chalked pigments from all auto finishes. Makes a perfect base for MAC'S-IT SUPER GLAZE, the exclusive paste-type formula with imported resins that actually harden the paint itself. Now, both CLEANER and GLAZE are packed together in this handy kit. At service stations everywhere.



DON'T WAX IT, MAC'S ITI

# AIR LIFT



LOW AS

The only air-adjustable overload spring - fits any car or light truck.

A safe, level ride for vacationers, sportsmen, businessmen, trailerites.

Ouickly installed - no parts removed from car.

Write for FREE Literature: Dept. 138

OVER 1,000,000 SETS IN USE



Keeping Line Fences Within the Law

[Continued from page 145] finally decided to take his fence down.

Moral: In the eyes of the law, you're only "renting" a neighbor's fence when you share its cost. You never "own" it unless ownership is noted in the deed.

Build it in the right place. In general, a straddling or on-the-line fence looks best and wastes the least amount of land. But some owners are reluctant to incorporate agreements in their deeds for fear that they may annoy a subsequent buyer and make the property harder to sell.

If you can't get a neighbor to agree, better settle for a setback fence—one built a given distance back from your property line.

The distance of the setback depends. If your neighbor is friendly, two inches -to allow for survey error-may do if you reach an agreement for you to trespass for repair and maintenance of your fence. If he isn't friendly, better allow two full feet.

A caution: If your neighbor has a setback fence, make sure that the law doesn't forbid parallel setback fences.

Tom thought he could get around a cranky neighbor by building a similar setback fence, only to discover that the local ordinance recognized the first fence as the "established" one. He had to tear down his own fence, hook onto the existing one and pay his neighbor "rent" for the privilege, to boot.

Mind your clearances-street, alley and sidewalk. Most communities specify that a fence cannot be built on public rights-of-way. This is to protect vehicles and persons from harm from your fence.

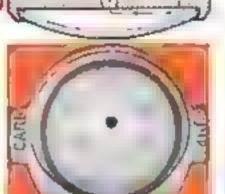
Streets, particularly rural roads, are often deceiving. Minimum road width is usually 50 feet, yet the actual paved area is seldom more than about half this.

Jim, who was proud of the fine, full hedge he'd grown along the front of his yard, was happy to hear that his town had finally decided to put in a sidewalk —until he learned that his hedge would be growing smack down the middle of it.

Hedges, incidentally, are fences in the eyes of many communities. The same restrictions on height and placement apply to them. Permissible fence heights vary anywhere from 3'6" to 5' for a front fence to a maximum of 6' for a side and back fence.

#### GUARANTEED ta eliminate:

- all pulsation to carburater
- all vapor lock
- meter spitting
- meter stalling
- motor flooding
- motor jerking



#### GUARANTEED TO DELIVER:

 correct gas pressure and volume—always gas savings better mileage

SAVES GAS & CAR

- maximum power
- faster starts

FR Fuel Control is not a gadget—but a scientifically proven gas regulator and saver. Guaranteed 100,000 miles. Compact sealed unit no glass brass beliews. Easy to install in 15 minutes. A "must" for cars, trucks, outboard motors, Only \$5.95 ppd. Money back in 30 days if not satisfied. Order today t

FR FUEL CONTROL Co., Dent. 3, Linthicum, Md.





#### NO TUBES—FRANSISTORS— BATTERIES OR "PLUG-INS" NEEDED

Smalper than a park of figure es Hills m of notice that a park of tighte es fish in the notice that the park before a factor of the fisher of the fisher of the notice 
SEND ONLY \$2.00 mach the most and pay agree value are specified to the sense of the

#### **BOAT PLANS**

full to an Par

full-size

**PATTERNS** and

> FRAME KITS



that deposit on a go to also PLANN PRINT OF FILENCE 苏州市

ArTS were red for other ex-ment the for a scratter of a 40 years ing a af rese tog user it som beard and bottomal de and

GLEN L

5 52P HOTELFARS Baill fow at Caref

#### **GOVERNMENT OIL LEASES** LOW AS \$1 PER ACRE.

You do no drilling, pay no taxes, may realize a king-size profit without ever leaving home. Write for free map and literature.

AMERICAN OIL SCOUTS, Dept. PS 8350 Sente Monica Blvd. Los Angeles 46, Calif

heip YOUR FUND



table no eye a limit to a aggree 2 HP case attended Briggs company of a plug to and o aggree Piculy of Current for any or burner for a company of a second company of बद्धानुग Plenty of Current E e may a bigner for a cy I mader e erzes y chis et alitch et mise an a fe e evi state ard encles and encles and the encles and out to mail date to chance of e e evi state and out to mail date to chance of e e evi state and out to mail date to chance of e e evi state and the encles and the encles are the beauty of the propagated \$143.50 and plant ecc at same as I em 24 but and \$199.50 general e and edge e with 5 ferrales out out.



MASTER AIR COMPRESSOR

COMPARE! This is the only comprehend built with a NO AUST principle steel tank Sale up to 500 lbs. An 3th-ligh sprander, see a clim large up used of a clim large up used to be a clim large up used to be a clim to the blade of the sale up to the sale of the blade of the sale up to the sale of the blade of the sale of the sale up to the sale of the sale of the sale up to the sale of the Task decrease Task 12'a2 bild rate in cap Law meet with nationally switch but there was a specific to the utility of the state of the s

where and rather on this sky hadren on a state of the region for a district of the compression are action new and are companied SAFE law factors in real to companied SAFE law factors in real to the SaFE law (from SaFE to SaFE).

top heavy duty model lies tod

dor A or fairt with lies this
to have hydraul of light plants, welders steam generalors, fans
and hundreds of pilter Hems all at low ow prices.

Send the far 100 page Catalog — FREE with order.

Prices Lie b. to force Send thech or M.D.

MASTER MECHANIQ MFG. CO., Bopt. 1 800 Burlington, Wis.

#### NEW S-FT. LONG BALLOOMS

Delight Kiddles - Grown - Ups too Made of five latex almost 5 Ft long inflated Balloons this alse usually sell up to 25c each Send only \$1 now plus 250 pats and help for 200 in variety of day colors! Supply limited at this low price, so order several sets Now Money Back Guar. Murray H.Il House, Dept B-13-E. PO Box 251 Bethpage. L. I.

😘 Twist into u 🗠 " Thousand Shapes for \$ 100 Giraffes—Dackshunds Pets of All Kinds ™

BIG TOWEL

That's right Two dozen large. soft. Buffy white towels for only at 00 tplus for for axira postage and hdig i large-size unwoven cotton and rayon towels for less than a nickel ap ecc. All orders on a first come, first served basis, so order ail you is need. Money back guarantee. Murray Hill House, Dept. T-13-A, P. O. Box 251, Bethpage, L. I., N. Y

BARGAIN



# TO (C) - (C)

Have a paying business of your own!

You're just a siep away from a profitable welding business: all your own. Hobert has sust the smill for you have cost - real mone, makers. Maphines libistrated give you an adea of the wide selection to choose from "Power Weld" Genter also scendes 210 y AC oower to run lights, for a motors, sprays, etc. Do top quality work light away we was is in his demand throughout the country invest gate today. Get complete information. No obligation.

#### CHECK HERE

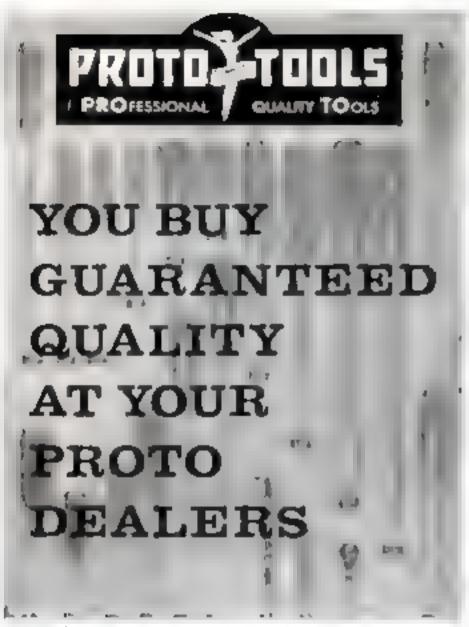
A DB DC

Put name and address in margin of this ad and mail.

(A) Sh p Type Transigrmer.

(8) Physics Common news

BROS. CO., Box P-89, Troy, Ohio, Phone FE 2-1223



2203 Santa Fe Avenue Los Angeles 54, California Jamestown, New York Canadian Plant: London, Ontario

PROTO IS A DIVIS ON OF PERDLETON TOOL INDUSTRIES, INC.



Paints anything from a house to a toy. Saves its cost on the first major job! Speedy Sprayer does in minutes what brushing takes hours. Finish is smooth, flawless. Uses any ¼ h.p. motor with ½" shaft. No. 780 Outfit—10 ft. air hose, tire chuck, quart gun, less motor, only \$32.00. Every workshop should have it. At leading stores.

Free! Write for "How To Spray" Bookles and folder.

#### W. R. BROWN CORPORATION

Specialists in Portable Paint Sprayers for Over 37 Years
2637 N. NORMANDY AVENUE, CHICAGO 35, ILL.

#### How to Have Ants in the House

[Continued from page 153]

apart, with a circular saw, in an 8'-long piece of two-by-two pine. These kerfs take glass panels when the frame members are cut and the house assembled. Drill three small holes through the top frame member. Attach pieces of sponge under two of these for moisture, leave the other free for feeding. Fit a piece of tin or aluminum to slide along the frame and close the holes.

Two pieces of deep red cellophane fitted over the glass will cause the ants to behave as if in total darkness, but you still will be able to observe them. If desired, black paper can be held in place with pins while the ants are not being observed. (When observing for long periods it's a good idea to use a red bulb as a light source.)

Arrange the soil in the container somewhat as in an aquarium—pebbles on the bottom, coarse gravel next, fine gravel, and a thick layer of moist earth on top. When the ants are introduced, the house should be three-quarters filled with material from their natural habitat.

Complete ant colonies, consisting of workers, larvae, pupae and a queen can be bought from many of the natural history, biological or science supply houses, or through most pet shops.

More interesting, though, is for the collector to hunt his own ants. This is best done during the summer months when ant life is at its peak. The collector should take along a shovel or trowel, a large piece of cloth, forceps, some string and a pair of gloves.

Ants that build mounds are usually best for amateur study. They can be found on the southern slopes of hills, in fields, in shaded glades and under old logs and large rocks. Dig a circle a foot or so in diameter around the mound. slowly lift the cover and lay it on the ground. Capture a few workers along with a number of grubs and cocoons. Make a special effort to find and capture the queen. She is wingless, larger than the workers, and in most cases, somewhat shiny. Place earth and ants in the center of the cloth, lift up the corners and secure them with string. Replace the mound cover to help the colony reestablish itself.

When you reach home, put the sack in the refrigerator for 20 minutes to quiet

#### WAR SURPLUS DECEMBERS

SOUTH WIND HEATER & ACCESSORIES

Mid for govt an tareful especificous for feets and half-tracks fleating unit puts out over 20 700 B.T.C.'s, Buting any type gas. 6 volt system Puel consumption extremely low 1 gat per 8 hrs. Terrific for Irucks books, tractors farms, werehouses, ranches, bust houses, calune, etc. Complete with service & metalization manuals and over 260 components Approx GOVT COST \$550 Shpg. wt 120 lbs. gross \$39.95. Limited quantity.

RI GENERATOR - 300 AMP Nake your own are weiding and battery charging unit Terrific source of power for all 24 32 V equipment Simple installation with our wiring diagram. All generators pre-tested to our own shop Approx. GOVT COST \$400. Like NEW \$16.50

GENUINE P1 GENERATOR -200 250 AMP Use for same purposes as above. Approx GOVT COST \$250 Like NEW \$14.50.

DOUBLE-V SPLINE 3" FULLEY PROPERTION Gen. shown store. Heavy duty machine broaded steel Hone y constructed, will hard a any job. Set acress locked thing. We 7 Res NFW \$8.25

ACCESSORIES FOR BUILDING ARC WELDER for above generators consisting of Vol Tage Regulator 3/00 AMP ammeter 300 AMP, shunt, heavy-duty wesder's gluces, 50' welling cab selectrode holder phensial, welder's helmet think type. Gant electrods holder Pheostal, walder's helmet thread type G and Toggis Switch All O items — Approx. GOVT COST \$150. Like NEW -- Complete \$21.50.



BENDIX GEROTOR PUMP & MOTOR-NEW!

The wherever fluid pumping required. Excellent for hydrautic mataliations. Has \$\frac{3}{2}\$ pipe connections, built in relief valve adjustable up to 1500 lbs. Max cap. 6 GPM 122 H.F. 24 V motor Use on 12 to 35 V Approx. GOVT COST \$350, \$8.75.

ELECTRIC PUMP WITH CONTROL UNIT
Runs on 12 or 24 V Centrifugal type. Draws 5.2 AMP8 9 Has built in removable fatering screen Gress for hilgo principality or sump pump ball tanks, etc. Pumps 500 GPH Complete with on and off switch rheastal, 2 speeds the a located by Ingersoll-Rand. Shop, Wt. 7 lbs. Approx. GOVT COST \$195 NEW \$8.58.

140-1 REDUCTION GEAR For beaching boats, winches, hoists. Ideal for motor in golf or boy's electric car fit' motor & clutch Eastly reversible wiring diagram furnished Hi torque. 1° speed, Rans on 6-12 or 24 V WI 65 lbs. gross. Approx GOYT COST \$300 Like NEW, \$12.00. Matched splined gear for above \$3.00 ns. #223-1 Reduction Gest — \$13.50

WELDING CARLE DOUBLE-O heavy duty pro-print factor faberg as Insulation NEW Approx GOVT COST \$40 Will handle 400 amps, or better 50' lengths \$14 \$6. 100" Sangths \$25 60.

1968 CATALOG! goat ever-fully situateshed 1000s of hargains in war nor plus & other items flore 25c in coin for your copy today! Where 1981 indicated applies to 1 8 only (tithey refers FUB Culver City Call Send resh, where manny order 50% den 100)

AIRBORNE SALES CO., INC. DEPT. PS 459



AMAZING, PERMANENT, NON-ELECTRIC. HIGHLY PRACTICAL.

obtoper Dispose by experiments flued ods of gave Betreve valuable steel items such as guds, tarke from tresh or sain waver to be from to be a day of Quananttee Try any magnet one week.

Somey steel if you are not we i pleased.

No R 7. Wt 52 of ) Has gul of 228 the on steel took \$18.00 on R 635 (Wt 7.2 of ) Has gul of 123 be on new beek \$10.00 of R 573 (Wt 18 of ) Has pull of 75 his resistent took \$ 7.00 of R 573 (Wt 18 of ) Has pull of 75 his resistent took \$ 7.00 of R 573 (Wt 18 of ) Has pull of 75 his resistent took \$ 7.00 of R 500 kt. of be flames 5 Pairs 110 Magnets.

Some R 500 kt. of be flames 5 Pairs 110 Magnets.

Some R 47 Hot Pad Magnets 10 for \$1 (0).

Some R 57 Has Pad Magnets 10 for \$1 (0).

Some R 57 Has Pad Magnets 10 for \$1 (0).

Some R 57 Has Pad Magnets 10 for \$1 (0).

Some R 57 Has Pad Magnets 50 for \$1 (0).

MIAMI MAGNET COMPANY, 3240 N.W. 27th Ave., Miami 42, Fla.

AD RESTARCE (ER BO



No. 33 Works the same as No 44, but without asw Adjusts guide attachment.

00 1

SUPER FILER No. 11 For both band and gierular alifa tipesi Clas di correct pitch and \$9.91 ppd. SEND FOR

FREE Catalog.

4

A. D. McDurney, 5906 Hollywood Blvd., Hallywood 20, Calif. Dept.: 5-89

Million Dollar Inventory -- All Famous Brands



SAVINGS NEVER LESS THAN 50% UP TO 70% OFF REGULAR PRICES ADQUARTERS FOR ALL SPORTS CAR TIRE SIZES BEND FOR YOUR FREE CATALOG! . 730 MORRAM ALVE.



dial new dado widths in seconds



YOU CAN BE IT WITH A COMET QUICK-SET DESIGNED FOR FAST, PROFESSIONAL PRECISION

It fits any table or radial arm sew...cuts to a depth of ¾"I Diel exact widths (from ¾" to "%;"), trem the proof, Cut pe dedes, rehitets, and ploughs with COMET balanced, tool-stool blades. They stay sharp 5 times longer!

For true woodworking satisfaction, get a high precision COMET HOME WORKSHOP! If not at your dealer, write direct, (1997) Order by return mail, prepaid:

6" QUICK-SET DADO, \$19.95. 9" <u>ኒሲ"-1½," x 1" deep, \$44.95</u>

COMET MANUFACTURING CO. 2633 Santa fo Ar., Los Angolas 21 Cai





Indispensable for home use...and never before priced so low! This compact, all steel, powerful SWINGLINE 101 staple gun is ideal for insulation, carpentry, upholstery, screening, wire fencing, plus thousands of other uses. Handle locks to fit pocket. Lightweight, maneuverable, jam-proof! Staple sizes ¼", ¾". Send for FREE book—"Tips for Tacking".

Swingline ING.

Dept. S-B-9 Long Island City 1, New York



it's easy, it's fur. ... Yenella Sterenson.

High fidelity STEREO sound can be yours at savings of 50% or more. HEATHKIT step-by-step instructions, written especially for beginners, assure swift and successful assembly. Send today for the FREE catalog listing over 100 easy-to-build HEATHKITS.



#### How to Have Ants in the House

the ants and cause them to gather in clusters. Then with newspapers spread below the container—or better still, in the back yard—carefully pour ants, dirt and all into the ant house. A few drops of honey-water mixture applied with an eye dropper to one of the sponges, and the other sponge saturated with plain water, will complete the homecoming. Place the colony in a cool, dark place, and forget it for a few days while the ants build tunnels against the glass walls.

Care of the colony is simple. Keep the two sponges damp and supply a balanced menu. Most American ant species will thrive on a diet of honey water, small bits of cooked meat, dead insects and an occasional piece of nut. Different foods should be given experimentally—a little at a time and not more than can be readily disposed ot—until a regular schedule is worked out.

One big treat for the ants is a twig covered with ant lice or aphids. These are the "cows", that, for their keep, secrete a sweet fluid as another item for the ants' diet.

As the ants get used to their new mode of living and settle down to routine, the careful observer will gradually make sense of what is going on. The ways of ants are certainly similar to the ways of man, but this, of course, is due to instinct

rather than intelligence.

The first thing that one notices is that there are different classes of ants. By far the most common are the workers. Actually, like their cousins the worker bees, they are undeveloped females. They do all the work in the colony, except for the queen's egg-laying duties. (Sometimes the workers, too, lay eggs—but they always hatch males.)

Depending on the species and the age of the colony, there may be more than one queen. Their only duty is to lay eggs (at times up to a hundred a day), and they are pampered and preened, fed and

protected by the workers.

Science-fiction enthusiasts envision planets in other galaxies with weird and exotic societies and cultures rivaling man's in complexity and organization. But consideration of the ant—who reached maturity millions of years before man was seen on earth—will give excitement and adventure to satisfy the most curious.



GOYT SURFLUS EXCESS INVENTORY BANKRUPT STOCK

#### AIR COMPRESSOR BARGAINS



For painting, cleaning tires control term ter Assemble your own outst and save money. Lowest prices in U.S. at them #480. Deluge Kit. Compressor tank Raufe feet unite paint gun, re ef value fictions home, instruct one List 652 FALE \$35.40 FOR Air Components, Compression of the Components, Compression St. 
STORAGE BATTERY WINCH

Powerful fully reversible which there were reduction which there is a relation to the reduction to t





ruler bearings a d notor to 31 merenses 100 ue Shafts TO ED The opin 114 opinut Power we volving signs door openings etc.

FISH-WORM AC SHOCKER

o from x670. Harvest worths crear private ponds of coarse fish Powerfu 110 y to hand geared gen-WOFITE erator creares powerful electric

Se d in ground or water

O Also fase nating exict

interior at parties Has Super v

nets that Con \$12 BALE \$3.89 F.

#### OF THE MONTH!

FARMER-CONTRACTOR PUMP 205 是 4件 549 50 FUIL





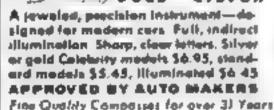
DIAL PHONE 34c

ORDER FROM AD or get free Catalog

BURDEN SALES COMPANY 830 West 'O" St Lintoin, Nehr

COMP HISTORY YOUR

#### IN BOMERTELL GOLDON SILVER



DINEMORE INSTRUMENT CO



Write for Folder

#### 1804-35 Muise St., Filet 1, Mich.

OIL Tester

He your net take all expert. New, thaple Labe O Tester' shows engine where no contaminants in used one is the et a correstre as is, nitras to a ids, water Tells you as ent finally whether a foreby all and more differences of the first changes of a drawn if and the other changes of a drawn if and pre-out end by dimbre overbalds. Date O Tester in a lapted to but by out at a manager developed for \$ 28 Contravent and used to him and fleet operation. Results are fast and used are. Morey back go are not be a bost it and the many and have by do not so the tests there of so up to the ball it all courses before a home or he to Gordon Laboratories, P. O. Box 15468, Townsworth Bullding, Annapolis, Md.

RETAIL PRICE \$123.00

#### FACTORY TO YOU S

SUPERSHOP includes precisionbuilt 4" tilting table saw, vertical and horizontal drill pross, 30"

catalog, full details, trial plan.

UNITED INDUSTRIES, INC.



lathe, sander, grinder. 100% BALL BEARING. Write for FREE

Power Tools Division 222 TATES AVENUE SELDIT. WISCONSIN

# in recondul The super-penatrating rost salvant MRENCH

that quickly loosens rust and cor-

AT ALL HARDWARD AND AUTO STORES

RADIATOR SPECIALTY COMPANY EMARGRAPHY, MINTH CARRIES

# LIQUID WRENCH

MALWAYS USE ME TOOM

SUPER

PENETRAN

The very finest lubricating all available for machinery, watches, sporting goods, seving methines.



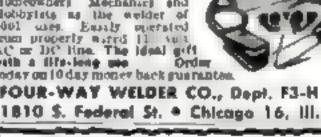
EALDER

CUT

Acclaimed by thousands of Hutbersnets Mechanics and Hotbylste as the welder of 1001 uses. Emply operated from properly wared it to a AC or DC line. The ideal get with a fife-long me today on 10 day money back guarantee

FOUR-WAY WELDER CO., Dept. F3-H

amplets with Twin Larbon Are toich and at Centeries handle showth. Craff worth



# ROCKET: PLANS

BUILD YOUR OWN WORKING MODEL SINGLE AND TWO STAGE

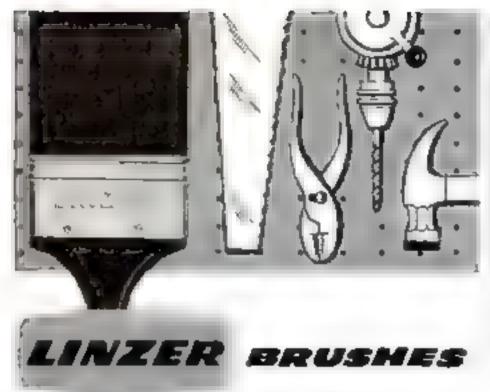
Detailed 12 pg. illustrated PLANS for: Rocket construction for 34" to 3/5" dia, rockets Launching platform Numerous solid fouls Electrical ignition How to measure firing height

Safety rules - Many other features Designed for high attitude perform-ance. Our plant may be modified to your own design and size.

Not a Toy - All For Only - \$1.00

ROCKETS, Dept. A-2 4106 Beecliff, Columbia, S. C.







ABVIELLIND

# belong with your other quality tools

The else that identifies the good craftsmen is the quality of tools he owns. And you're sure to see several LINZER breshes in his workshop because LINZER is the quality brush that puts the perfect final touck to his skill.

Sand 10c for "Painting Hists"

Since 1892

DAVID LINZER & SONS, Inc. 10-20 Asier Place \* New York 3, N Y.

#### ELECTRIC WELD - BRAZE & CUT

The Paris Most Everything Made of Metal.

A to a so be to be to be preferred equipment to Make and require player and repairment to mental line with gates ware at the second of the sec

### Shrinks Hemorrhoids New Way Without Surgery Stops Itch — Relieves Pain

For the first time science has found a new healing substance with the astonishing ability to shrink hemorrhoids and to relieve pain—without surgery.

In case after case, while gently relieving pain, actual reduction (shrinkage) took place.

Most amazing of all—results were so thorough that sufferers made astonishing statements like "Piles have ceased to be a problem!"

The secret is a new healing substance (Bio-Dyne\*)—discovery of a world-famous research institute.

This substance is now available in suppository or cintment form under the name Preparation H.\* Ask for it at all drug counters money back guarantee \*Reg. U.S. Pat. On

#### Do You Save With a Small Car? [Continued from page 81]

Repairs come high on any car because the major cost is labor, which doesn't scale down easily even on a small car. Despite the fact that it has only four cylinders, a tune-up or valve grind is little cheaper than on a big car. It's often argued, too, that these little mills require more service because they work harder and are stressed more

But in Endwell, N. Y., four Fiat 1100 sedans used as taxis have covered over 80,000 miles apiece. Only one has had new pistons and rings. The others haven't even been treated to a valve grind, "Oil consumption was modest up to 45,000 miles," says Earl Bouton, president of the company. "Now they burn some."

You can stretch mileage between garage bills by proper maintenance and good driving habits. A 1956 VW I know of has done 37,000 miles with nothing but a new muffier, new plugs and routine tune-ups.

What do repairs cost? A clutch overhaul on a Plymouth six runs to about \$60 in the New York area. On a Buick, parts alone come to that. One shop in Westchester County, N. Y., quoted a complete clutch job on a Dauphine at \$70, a Rambler American at \$50, and a Peugeot at \$75. Another lists labor alone on a Dauphine at \$55, and puts the total bill at \$89.

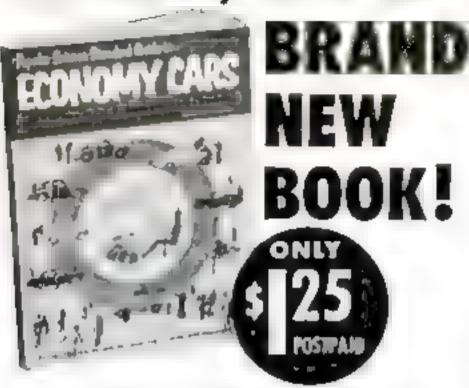
Relining brakes, I was told, would cost \$28 on a Rambler American, \$34 on a Dauphine, \$45 on a Peugeot, A New York City garage operator said the labor alone for relining Simca brakes would be \$35. Another put it at \$12.50. The moral: With imported-car servicing still young, a buyer should look hard at the service he'll get before he needs it.

At a well-equipped suburban VW agency, I was quoted \$27.50 for brake relining. The VW buyer can use a preventive maintenance schedule laid out by the factory. It's said to hold servicing costs for the first 30,000 miles to about 4 cents per mile, including grease and oil changes.

You save on tires with a smaller car, chiefly because of lighter tread loading. Heavy domestic cars commonly overload tire capacity by five percent. Most im-

CONTINUED

#### Everything you want to know about Economy Cars in this



Popular Science Standard Guide to Economy Cars is the year's biggest value to any man buying a car today! Completely illustrated with more than 400 photos and cutaway drawings! Gives actual facts, figures, prices and dimensions of every foreign and U. S. economy car on the market today!

Thousands of never-before-published facts on gas mileage, initial cost, repair and upkeep, leg and head room, safety features, comfort, road-ability, transmissions, spare parts, accessories. Schematic drawings show you in feet and inches actual space in every model! Amazingly complete in all details! Handsome photographs let you compare and pick the car that suits your family's needs best!

THEY'RE ALL HERE: Minicars. Compact Cars, Small Cars, Convertibles, Sedans, Station Wagons! Frankly details and discusses the advantages and drawbacks of each of the 37 names manufactured today. All information based on actual driving experience in stock cars. Handy Glossary of Terms.

Don't delay! Order your copy of Popular Science Standard Guide to Economy Cars for just \$1.25 NOW! Guaranteed to please you or your money back!



Popular Science Publishing Inc. 355 Lexington Avange, New York 17, N. Y.

859

Here's my remittance! Rush me., Populer Science Standard Guide to Economy Cars. Illustrated and bound in hard-gloss paper. @ \$1.25 per copy, postpaid. Money-back guarantee.

Name\_ Address.

City.



P - New Hors PIGHTING KHIPE web should 2 Mg

GEMMINE U.S. AIR FORGE

Here to the best in head protection for the Sports Cor. Hot Word, Book or Cycle Roces. Made to toe Gov'l seecifications. Crosh sad reside. Sizes. Small Med., Large. Ot good by cost Gov's engress. 14 O. Good condition





This of our bost cambring imparts Made of Firm que ity DFS upterproof mater a , rainforced at the corners, unap-button closure & builting moraulto net at opening. HOW

er with amounted carrying cone with about dur strace, Hos 2 cart one makes, seven stakes and two, & fact the rapets.

#### MEW IMPORTED . I AIR MATTRESS

A large 30"x72", heavy duty welless of special relitorized reducted to give rugged For Cusper, Humber, Fraherman, etc. 788

Packed with handcods of monet burgains for home or perce - private New Policy Hydrouler Equip supplement. Send 254 Today to sever the handling and welling

ORDER FROM THIS AD - Send Clearly or Menny Order, 1/2 deposit with C.O.D. p. All thoma abipped to you pastage of feelaht cullect.

2763 E VERNON AVE Dept. PS-29 LOS ANGELES SA CALIF





# CLOCCED SEWERS TO CLEANED INSTANTLY SAVES PLUMBING BILLS -

Free Residet ma New Plansvery which enables the Home Owner, James, or Factory Manaterance to clean any Cloques Newer Deals.

Fet algress can operate this new Flombers Firshing Gun which releases are pressure on a mild short of water cleaning the most study by mild feet. Trill ETS, RINKS I HINAIN BATHTI 196 FLOMB DRAIN LONG MALE TO MERKET NEW-LIN cloques with Greane Hass. Nand, Roots, and super neit away instantly when struck by the Hammer like bit or of this new unit. There is no need to remove wail or pipe of Greane Trap. A special attachment allows again to flow from the fauget through the flug while air is released on the pipe. Yents or stocks are no obstacle, as force tends to a the whetever the water lays. But now what is this Plumbers Flush by Cup worth in COSTLY PLUMBING BILLS SAYEOT. That this Ad out may my be a surface and a best heads it for FREE SOOKLET. Obey that write No agent will call A post-card stands. On the page Plumber R. Lays 5 17025 MILLEN SEWER ROD CO. DEPT. PS 8, 4440 M. Central Ave., Chicago 30, (Bluess.)



Do You Save With a Small Car?

ports underload their tires, some by a wide margin. The result is 30,000 to 40,000 or even more miles from each.

A case history involving three cars is that of Frederick Lockwood, a publisher's representative who drives long distances. He sold a two-year-old Ford station wagon that had cost him \$3,300 for \$1,400, taking a depreciation of \$1,900 or \$950 per year. Then he bought a new Vauxhail at \$1,995.

In 13 months he put 28,000 miles on it without major repairs or tire replacement. Trading it on a Peugeot, he was allowed \$1,645, making his depreciation for the period \$350.

In seven months the Peugeot has been run 15,000 miles. Gas consumption at 60 averages 30 miles per gallon, Lock-

NEXT MONTH: It's still officially secret as you read this, but the wraps are soon coming off Detroit's first V-6 automotive engine. You'll get complete details plus a driving report in next month's issue of Popular Science.

wood says. In third-gear traffic driving, the car goes 23 to 24 miles per gallon. It burns a quart of oil every 2,000 miles. Total maintenance and service for 15,000 miles, including towing when a pump gasket blew, comes to \$78.98.

To sum up, you can probably save a substantial amount on gas, oil and tires by driving a four-cylinder economy car with a manual shift. You'll make secondary yearly savings on license, financing and depreciation costs.

If you drive under 5,000 miles a year, the per-mile savings will not be impressive. You may as well wheel a big car, and enjoy the advantages of greater capacity, flashy getaway, extra trunk space and automatic drive. Or you might compromise on a six, which has adequate comph, lots of room, splits the difference in per-mile costs, and runs about the same as larger imports in first cost and depreciation.

But if you cover big mileage, or like to use the car without thinking about cost, an economy four may be just the ticket. The smart thing is to know what the choices are. That way, you pay only for what you really want.

# MEN PAST 40

Afflicted With Bladder Trouble, Pains in Back, Hips, Legs, Nervousness, Tiredness.

If you have these troubles, particularly bladder trouble, then your condition may be traced to Glandular Inflammation . . a constitutional disease. Neglect of this condition often leads to premature old age and sometimes incurable malignancy

The Excelsion Medical Clinic has a New Free Book that tells how thousands of men have been successfully treated here at Excelsion Springs for Glandular Inflammation by NON-SURGICAL Methods. They found soothing relief and a new outlook in the future of life.

This Free Book may prove of utmost importance in your life. Write Today. There is no obligation.

Excelsion Medical Clinic Dept. 86229 Excelsion Spgs., Me.





#### BALLOON MAIL

was f wh for first time ast 1:H) years ago this mouth A, swe had whe sould her I M arrival Ata or serve tend whe sould her I M arrival Ata or serve tending he had the rest to a my engraved or welcope carrying the new starry and tender of the serve starry and tender to the first tay I was to exceed the with a Free to Mile the carry the ferror kells we set a strong of homes. PLUS a ferror kells we set a strong of homes. PLUS a ferror kells we set a strong of his day I had a manager with the day I had a strong that I had some and the carry the day for any of effect carry.

K. M. WALSH, Box 308-H, TUCKANOE, N. Y.





# If it takes more ACCURACY it's a job for a FOUTH BEND 10" lathe

- · Accuracy that's a match for any job.
- Superfinished spindles with sleeve type bearings that hold tolerances for years.
- Herdened and ground bed ways optional for extreme conditions.
- Smooth, vibration-free operation for fine finishes.
- 6 More usable power.
- 1-1/16' collet capacity —70 threading, forgltpdinal and cross-foods.
- 14 engine and toolroom models.

#### PRICES START AT \$1282 F.O.B. FACTORY

WRITE for complete catalog of South Bend 9" to 16-24" lathes, turret lathes, miling machines, shapers, drill presses, pedestal grinders and attachments.

SOUTH BEND LATHE SOUTH BEND 22, INDIANA Building Better Tools Since 1906



.

Together, we studied the graph.

"Your breathing was very steady," he remarked, pointing to the top line, "except that right after the fourth question, as you can see, you exhaled a bit more than after any other. That might have been caused by a little sigh of relief."

His pencil moved to the second line.

"Your galvanograph is erratic," he noted, "probably because of a slight general tension about taking the test. But it hit a peak just as I was about to ask the fourth question. It was whether or not the sum you took was about \$500. You had become aware that I was raising the amount \$100 with each question, and that peak indicates a surge of tension as you anticipated the figure \$500.

"Now," he continued, pointing to the bottom line. "Your blood pressure was steady, and your heart—except that just after the fourth question, it gave a little

extra beat. See that upstroke?

"Putting all these bits of evidence together," he concluded, "I'd say there was around \$500 in that wallet."

I looked at him in wonder.

"You're certainly right," I said. "But I don't understand how I gave myself away. I wasn't conscious of any special emotion when I hed about the amount."

He laughed. "Well, now you know you can't fool a he detector. People come here under the influence of liquor, or sedatives or dope—any one of which would make the test results unreliable But we can spot them fast, and we refuse to test them that way."

"Aren't there other ways of distorting the polygraph record—ways that might

be more subtle?"

"You want to try a few?" the lieutenant asked. I nodded, and he hooked me up to the apparatus again.

First, I stealthily squeezed my left

hand into a tight fist.

"Aha!" exclaimed Lt. Puddy. "Look at

the bottom line of the graph."

I glanced over at it. The stylus that was making the blood-pressure-and-pulse recording had nearly shot off the paper.

"You know enough about this already to realize that that is a completely abnormal response. Nobody's blood pressure or heart would behave like that."

Next, I crossed my legs and tensed the

muscles in them. Again the bottom stylus of the polygraph went wild, and the galvanograph recording, on the middle line, looked hysterical.

I tried one more trick. I held my breath for an instant or two, as a guilty subject might do to try to slow his pound-

ing heart.

It was useless. Lt. Puddy showed me a telltale pattern on the top line of the graph. The stylus had moved upward as I inhaled, and then drawn a broad plateau that continued until I exhaled.

"When we catch a subject doing that," the lieutenant said, "we sometimes just stop asking questions, to see how long he

can hold his breath."

"Well, I give up," I said. "The lie de-

tector wins."

"Don't be too readily impressed," Lt. Puddy warned me. "The polygraph is a fine, sensitive scientific instrument, but it is of no value at all without a well-trained, fully experienced operator. That's why courts hesitate to accept it.

"At best," he continued, "the polygraph is a very valuable aid to investigation—but it is no substitute for it.

"Almost anybody can learn the mechanics of the equipment in half an hour, but it's how the operator asks the questions, and what questions he asks, that count. It takes months to learn these details."

Los Angeles, whose Police Department began experimenting with polygraph examinations in 1924, was the first major U. S. city to give the lie detector serious official status. The Police Department's Scientific Investigation Division now has six polygraph operators. All are college graduates, and have undergone long, intensive training before being allowed to test subjects on their own.

They have had the satisfaction of helping to nab the guilty, and the greater satisfaction of clearing the innocent.

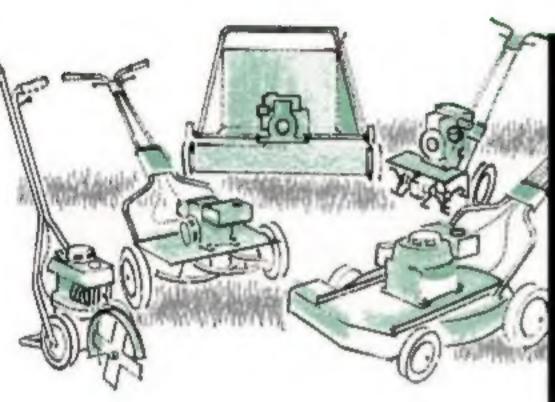
And they have learned that one of the greatest assets of the lie detector is its psychological impact. Over and over again, a person undergoing a polygraph test becomes so awed by the accuracy with which his emotions are exposed that he doesn't even finish.

"Aw, what's the use?" he'll say hopelessly. "I might as well tell you . . ."

This one UYFN-C5R-WN2Q

# AC announces...

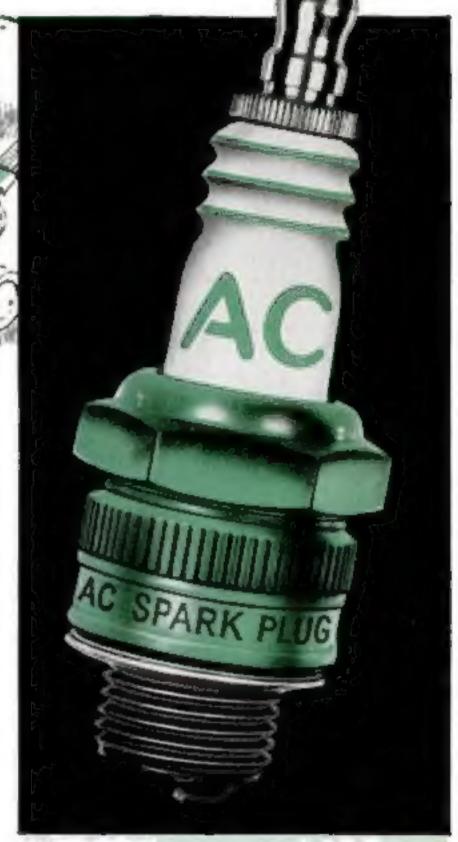
# New, <u>Specially Designed Spark Plugs</u> for peak <u>Power Mower performance!</u>



Now, here is a line of quality spark plugs specifically designed for power lawn mowers and other powered garden equipment — from America's leading manufacturer of spark plugs, AC Spark Plug Division.

Notice the bright plated universal terminal, the new spin-on gasket for easy installation, and the unique, easy-to-identify green shell. These new AC Spark Plugs provide the best possible performance and reliability for all your powered garden equipment.

The new AC Spark Plugs are manufactured to the same rigid specifications as AC Automotive Spark Plugs—used on more new cars and trucks than any other brand. Be on the look-out at your nearby lawn mower dealer, hardware appliance store or garden appliance shop for the new AC Quality Spark Plugs with the Green shell.



For marketing information concerning this new line of AC Spark Plugs, Dealers are invited to call their local AC wholesaler or write AC Spark Plug Division, Flint, Michigan.

Carrol tel Islikilik

# Why Does Daddy Sleep So Much?

easily lose their natural pep and energy, feel worn-

d dromaritation provid be professional medicis.

Sometimes I couldn't blame my little boy for wandering. It seemed as though the only thing my husband enjoyed was SLEEP!

Night after night my husband came home from work completely worn out - nervous and irritable. He after skipped supper and fell right into bed. What kind of companionship was this for his children, his friends, his wife?

Frankly, I was worried. My husband used to be such an active, energetic man, But for some reason he now seemed too tired to do anything. Even on weekends, when other men went places and had fun with their families—he complained of being just too tired! I wandered what I could do to help him.

One day I saw a Vitasale ad in a magazine. It said that same men, just like my husband, could

out and run-down, act nervous and irritable becours of a prolonged deficiency of essential vitamins and minerals in their diets. The ad revealed that thousands of otherwise normally healthy peaple had increased their pep and vitality through the famous Vitasafe Plan. Maybe this Plan could help my husband too.

I sent for the 30-day trial supply of Vitasofe High-Potency Capsules that was offered, and when they arrived, try husband started taking just one a day. Refore long he was acting like his old self again - peppy, energetic, and wide awakel

If you'd like to help your husband as I did mine, mail the coupon below for a 30-day trial supply of proven Vitasafe High-Potency Copsules without risking a pennyl



25¢ just to help cover shipping expenses of this

## FREE 30 days supply High-Potency Capsules

LIPOTROPIC PACTORS, VITAMINS and MINERALS

Safe, Butritional Formula Containing 27 Proven Ingredients: Glutamic Acid, Choline, Incatiol, Methicnine, Citrus Biofiavonoid, 11 Vitamins (Including Blood-Building Bill and Folio Acid) Plus 11 Minerals

To prove to you the remarkable advantages of the Vitasafe Plan , . , we will send you a free 30-day supply of high-potency VITASAFE C.F. CAPSULES so you can discover for yourself how much stronger, happier and peppier you may feel after a few days' trial! Just one VITASAFE CAPSULE daily supplies your body with adequate amounts of each and every vitamin believed essential to human nutrition. Also included in this exclusive formula are Glutamic Acid an important protein constituent derived from natural wheat gluten-and Citrus Bioflavonoid. This formula is so complete it is available nowhere else at this price!

#### NOW AMAZING PLAN SLASHES VITAMIN PRICES ALMOST IN HALF

With your free 30-day supply of Vitasafe High-Potency Capsules you will also receive complete details regarding the benefits of an amazing new Plan that CIPSE VITABAFE CORP.

VITASAFE CORP. 43 West filst Street, New York 23, N. Y. Yes, I accept your generous no-risk offer under the Vitasafe Plan as advertised Popular Science Send me my FREE 30-day supply of high-potency Vitasafe Capsules as checked below: ( Men's Plan ☐ Women's Plan I ENGLOSE 25g PER PACKAGE for pucking and postuge. This offer is limited in those who have never before taken advantage of this generous trial. Only one trial supply under each plan per IN CANADA: 394 Symington Ave., Toronto 9, Out. (Canadian Formula adjusted to local conditions.)

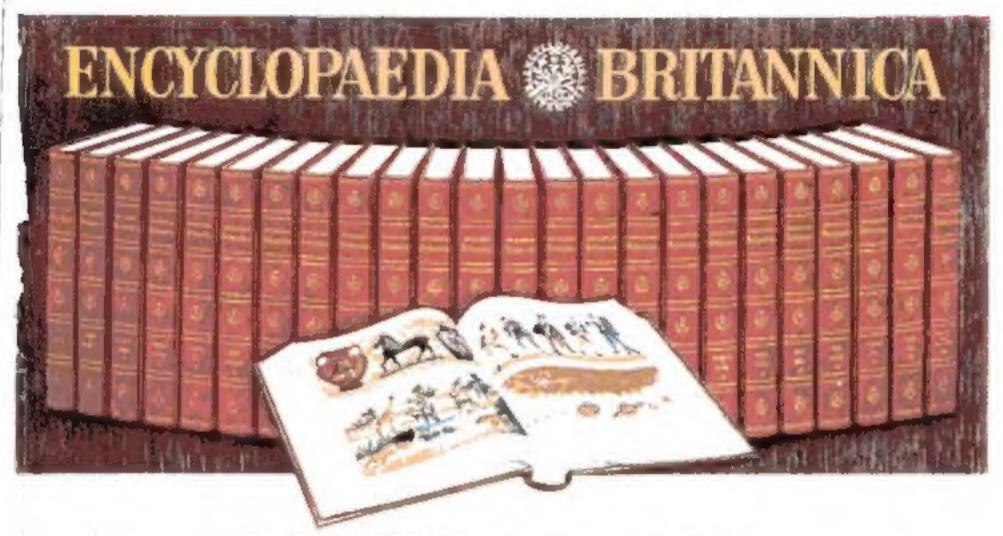
provides you regularly with all the factory-fresh vita mins and minerals you will need. By participating is the Vitasafe Plan now you are never under any obliga tion! When you have received your first 30-day tria supply, simply take one VITASAFE Capsule every day to prove that this formula can help you as it is helping so many others. But you remain the sole judge, If you are not completely satisfied, and do not wish to receive any additional vitamins, simply let us know by writ ing us before the next monthly shipment - or you can use the handy instruction card we will provide - and no future shipments will be sent. Yes, you are unde no purchase obligation ever; you may cancel future shipments at any time!

But if you are delighted - as so many people al ready are - you don't do a thing and you will continue to receive fresh, additional shipments regularly every month - for just as long as you wish, automatically and on time - at the low Plan rate of only \$2.78 plus a few cents shipping for each month supply. You take no risk whatsoever-you may drop out of this Plan any time you wish without spending an extra penny, by simply notifying us of your decision a few days before your nex monthly shipment. Take advantage of our generou offer! Mail coupon NOW.

MEN RECEIVE I	N EACH DAI	LT VIII	ASAFE CAP	SULE: -
Ditarirain 31.4 mg.	Vilamin C	71 mg (	Photphorous	58 mg.
Inoxital 15 mg	Vitamin B.	2.5 mg	Cabali	30 mg.
di-Wuthleining 16 cog	Vilamin Be	0.5 mg.	Copper	0.45 mg
Untamie Acid 50 mg.	Wineta Amilia	2 meg.	Manganuse	6.5 mg.
Complex 5 mg.	Calcium		Melybelenum	0.1 mg.
Vitamie A 13.500 USP Datu	Pantsthesale Vitamin E	2.55	Patantium	2 mg.
Vitamia D	Fulte Anid	6,5 mg.	Zios	0.5 mg.
1,000 UEP Units	Caleium	70 mg. 1	Magnesium	I mg.
— ALSO AVAILABLE, A VII	NAMES AND THE R	Cuntal Cit	CONTROPORT SEE	EMILES.

VITASAFÉ CORPORATION 43 West 61st Street, New York 23, New York HUW HORIIBE... BIPER 18 980 11811 THE FORMS

BRAND NEW EDITION OF THE WORLD FAMOUS



You Get All 24 Volumes Now... Pay Later

#### On Easy... Book a Month Payment Plan

Britannica—the greatest treasure of knowledge ever published—is now being offered on a remarkable direct-from-the-publisher plan that puts this world-renowned reference library within reach of every family. All 24 volumes will be placed in your home NOW ... you pay later on convenient budget terms. It's as easy as buying a book a month.

Savings Passed on to You

You may wonder how we're able to make this truly amazing offer. First, because of the great demand for this magnificent set, we have ordered a tremendous printing. This enormous printing materially reduces our costs and, under a remarkable direct-from-the-publisher plan, we pass these savings on to you.

In the brand-new edition of Britannica, you will find thousands of subjects that you and your family will refer to in the course of your normal day-to-day affairs. For example, you'll find special articles on household budgets, interior

decorating, medicine and health, home remodeling, child care, adolescent problems, rules and regulations for all sports, every kind of hobby . . . plus a treasure house of knowledge on all subjects. Useable information that can save you many dollars.

New Edition is Profusely Illustrated

The new Britannica almost "televises" information with 23,494 magnificent illustrations. But it does not merely show "attractive" pictures—it is the work of 5,565 of the world's greatest authorities.

Britannica in your home can give you the broad knowledge that makes people listen when you talk, enabling you to speak factually and intelligently on the widest range of subjects.

Essential for Homework

For students, Britannica is indispensable. It is the largest and most complete reference set published in America. Its use develops the active, alert minds that bring success in school and later life.

Britannica has always been the symbol of a good home. It is a treasure house of knowledge that can open a richer, fuller, more successful life to every member of your family.

Preview Booklet Offered FREE

Simply fill in and mail the postcard today, and we will send you . . . without cost or obligation . . . a copy of our beautiful new booklet which contains an exciting preview of the latest edition of Encyclopaedia Britannica. There is no charge—not even for postage. It's yours absolutely free!

Incolorso beautifully etched it gives the illusion of a third dimension, you will see art treasures of famous museums, world landmarks, scientific wonders. Also pictured is the most magnificent scenery on the North American continent, a cruise through France, the mysterious Orient, a Pacific island, and a rocket trip to the moon.

#### Offer Limited

Just as soon as we receive your postcard, we will send your free booklet. There is no obligation, of course. However, this offer is necessarily limited, so mail the postcard today.

Olip and Mail for FREE BOOKLET

Courtion: Se toto to tilly on dotted line.

Coopen became to fill sell galdressed policoid - needs no damper envelope.

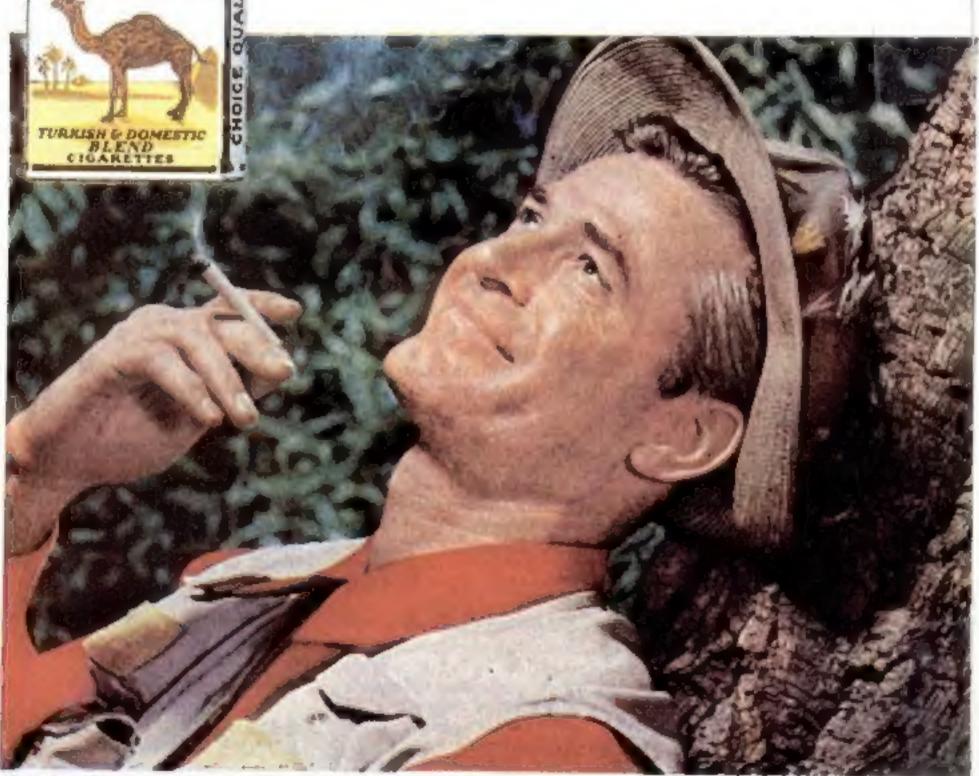


# If you're smoking more now but enjoying it less...

# CHANGE TO CAMELS - A REAL CIGARETTE

The best tobacco makes the best smoke

One puff and you know — here's smoking as smoking should be. Rich, satisfying, clean and fresh . . . with the easygoing mildness you want. No other cigarette gives you this complete satisfaction. Why don't you change to Camels — and really enjoy smoking?



H. J. Reynolds Tohanco Cn., Winston-Salem, N. C.

CAMEL

Have a real cigarette – have a CAMEL